SERVICE MANUAL

2014 - 2024
FOREMAN & FOREMAN RUBICON

A Few Words About Safety

Service Information

The service and repair information contained in this manual is intended for use by qualified, professional technicians. Attempting service or repairs without the proper training, tools, and equipment could cause injury to you or others. It could also damage the vehicle or create an unsafe condition.

This manual describes the proper methods and procedures for performing service, maintenance and repairs. Some procedures require the use of specially designed tools and dedicated equipment. Any person who intends to use a replacement part, service procedure or a tool that is not recommended by Honda, must determine the risks to their personal safety and the safe operation of the vehicle.

If you need to replace a part, use Honda Genuine parts with the correct part number or an equivalent part. We strongly recommend that you do not use replacement parts of inferior quality.

For Your Customer's Safety

Proper service and maintenance are essential to the customer's safety and the reliability of the vehicle. Any error or oversight while servicing a vehicle can result in faulty operation, damage to the vehicle, or injury to others.

⚠WARNING

Improper service or repairs can create an unsafe condition that can cause your customer to be seriously hurt or killed.

Follow the procedures and precautions in this manual and other service materials carefully.

For Your Safety

Because this manual is intended for the professional service technician, we do not provide warnings about many basic shop safety practices (e.g., Hot parts–wear gloves). If you have not received shop safety training or do not feel confident about your knowledge of safe servicing practice, we recommend that you do not attempt to perform the procedures described in this manual.

Some of the most important general service safety precautions are given below. However, we cannot warn you of every conceivable hazard that can arise in performing service or repair procedures. Only you can decide whether or not you should perform a given task.

⚠WARNING

Failure to properly follow instructions and precautions can cause you to be seriously hurt or killed.

Follow the procedures and precautions in this manual carefully.

Important Safety Precautions

Make sure you have a clear understanding of all basic shop safety practices and that you are wearing appropriate clothing and using safety equipment. When performing any service task, be especially careful of the following:

- Read all of the instructions before you begin, and make sure you have the tools, the replacement or repair parts, and the skills required to perform the tasks safely and completely.
- Protect your eyes by using proper safety glasses, goggles or face shields any time you hammer, drill, grind, pry or work around pressurized air or liquids, and springs or other stored-energy components. If there is any doubt, put on eye protection.
- Use other protective wear when necessary, for example gloves or safety shoes. Handling hot or sharp parts can cause severe burns or cuts. Before you grab something that looks like it can hurt you, stop and put on gloves.
- Protect yourself and others whenever you have the vehicle up in the air. Any time you lift the vehicle, either with a hoist or a jack, make sure that it is always securely supported. Use jack stands.

Make sure the engine is off before you begin any servicing procedures, unless the instruction tells you to do otherwise. This will help eliminate several potential hazards:

- Carbon monoxide poisoning from engine exhaust. Be sure there is adequate ventilation whenever you run the engine.
- Burns from hot parts or coolant. Let the engine and exhaust system cool before working in those areas.
- Injury from moving parts. If the instruction tells you to run the engine, be sure your hands, fingers and clothing are out of the way.

Gasoline vapors and hydrogen gases from batteries are explosive. To reduce the possibility of a fire or explosion, be careful when working around gasoline or batteries.

- Use only a nonflammable solvent, not gasoline, to clean parts.
- Never drain or store gasoline in an open container.
- Keep all cigarettes, sparks and flames away from the battery and all fuel-related parts.

How To Use This Manual

This manual describes the service procedures for the TRX500FM1/FM2/FM5/FM6/FM7/FE1/FE2/FA5/FA6/FA7 and the TRX520FM1/FM2/FM6/FE2/FA5/FA6/FA7.

Sections 1 and 3 apply to the whole vehicle. Section 2 illustrates procedures for removal/installation of components that may be required to perform service described in the following sections.
Section 4 through 26 describe parts of the vehicle, grouped according to location.
If you are not familiar with this vehicle, read Technical Features in Section 1.

Follow the Maintenance Schedule (section 3) recommendations to ensure that the vehicle is in peak operating condition and the emission levels are within the standards set by the U.S. Environmental Protection Agency (EPA), California Air Resources Board (CARB) and Environment and Climate Change Canada (ECCC).
Performing the first scheduled maintenance is very important. It compensates for the initial wear that occurs during the break-in period.

Find the section you want on this page, then turn to the table of contents on the first page of the section.

Most sections start with an assembly or system illustration, service information and troubleshooting for the section. The subsequent pages give detailed procedure.

Refer to the troubleshooting in each section according to the malfunction or symptom. In case of an engine trouble, refer to PGM-FI section troubleshooting first.

Your safety, and the safety of others, is very important. To help you make informed decisions we have provided safety messages and other information throughout this manual. Of course, it is not practical or possible to warn you about all the hazards associated with servicing this vehicle.
You must use your own good judgment.
You will find important safety information in a variety of forms including:

- Safety Labels – on the vehicle
- Safety Messages – preceded by a safety alert symbol ⚠ and one of three signal words, DANGER, WARNING, or CAUTION. These signal words mean:

⚠DANGER You WILL be KILLED or SERIOUSLY HURT if you don't follow instructions.

⚠WARNING You CAN be KILLED or SERIOUSLY HURT if you don't follow instructions.

⚠CAUTION You CAN be HURT if you don't follow instructions.

- Instructions – how to service this vehicle correctly and safely.

As you read this manual, you will find information that is preceded by a **NOTICE** symbol. The purpose of this message is to help prevent damage to your vehicle, other property, or the environment.

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SYMBOLS

The symbols used throughout this manual show specific service procedures. If supplementary information is required pertaining to these symbols, it would be explained specifically in the text without the use of the symbols.

	Replace the part(s) with new one(s) before assembly.
	Use the recommended engine oil, unless otherwise specified.
	Use molybdenum oil solution (mixture of the engine oil and molybdenum grease in a ratio of 1:1).
	Use multi-purpose grease (lithium based multi-purpose grease NLGI #2 or equivalent).
	Use molybdenum disulfide grease (containing more than 3% molybdenum disulfide, NLGI #2 or equivalent). Example: • Molykote® BR-2 plus manufactured by Dow Corning U.S.A. • Multi-purpose M-2 manufactured by Mitsubishi Oil, Japan
	Use molybdenum disulfide paste (containing more than 40% molybdenum disulfide, NLGI #2 or equivalent). Example: • Molykote® G-n Paste manufactured by Dow Corning U.S.A. • Pro Honda M-77 Assembly paste (Moly) (U.S.A. only) • Rocol ASP manufactured by Rocol Limited, U.K. • Rocol Paste manufactured by Sumico Lubricant, Japan
	Use silicone grease.
	Apply a locking agent. Use a medium strength locking agent unless otherwise specified.
	Apply sealant.
	Use DOT 4 brake fluid. Use the recommended brake fluid unless otherwise specified.
	Use fork or suspension fluid.

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SERVICE RULES

1. Use Honda Genuine or Honda-recommended parts and lubricants or their equivalents. Parts that don't meet Honda's design specifications may cause damage to the vehicle.
2. Use the special tools designed for this product to avoid damage and incorrect assembly.
3. Use only metric tools when servicing the vehicle. Metric bolts, nuts and screws are not interchangeable with English fasteners.
4. Install new gaskets, O-rings, cotter pins, and lock plates when reassembling.
5. When tightening bolts or nuts, begin with the larger diameter or inner bolt first. Then tighten to the specified torque diagonally in incremental steps unless a particular sequence is specified.
6. Clean parts in cleaning solvent upon disassembly. Lubricate any sliding surfaces before reassembly.
7. After reassembly, check all parts for proper installation and operation.
8. Route all electrical wires as shown in the Cable & Harness Routing (page 1-31).
9. Do not bend or twist control cables. Damaged control cables will not operate smoothly and may stick or bind.
10. Do not tow your ATV behind a car or other vehicle.

ABBREVIATION

Throughout this manual, the following abbreviation are used to identify the respective parts or systems.

Abbrev. term	Full term
2WD	2 Wheel Drive
4WD	4 Wheel Drive
CKP sensor	Crankshaft Position sensor
DCT	Dual Clutch Transmission
DLC	Data Link Connector
DTC	Diagnostic Trouble Code
ECM (FM models)	Engine Control Module
ECT sensor	Engine Coolant Temperature sensor
ECU	Electric Control Unit
EEPROM	Electrically Erasable Programmable Read Only Memory
EPS	Electric Power Steering
ESP	Electric Shift Program
EVAP	Evaporative Emission
IACV	Idle Air Control Valve
IAT sensor	Intake Air Temperature sensor
LCD	Liquid Crystal Display
MAP sensor	Manifold Absolute Pressure sensor
MCS	Motorcycle Communication System
MIL	Malfunction Indicator Lamp
PCM (FE/FA models)	Powertrain Control Module
PGM-FI	Programmed Fuel Injection
SCS	Service Check Short service connector
TP sensor	Throttle Position sensor
TR sensor	Transmission Range sensor
VS sensor	Vehicle Speed sensor

DESTINATION CODE

Throughout this manual, the following codes are used to identify individual types for each region.

'14 – '19:

DESTINATION CODE	REGION
AC	U.S. A.
CM	Canada

After '19:

DESTINATION CODE	REGION
A	U.S. (Except California)
III A	Alaska
AC	California
CM	Canada

MODEL IDENTIFICATION

'14 – '19:

This manual covers 10 types of TRX500 models:

Model name	FM1*1	FM2*1	FM5*2	FM6*3	FM7*2	FE1*1	FE2*1	FA5*3	FA6*3	FA7*3
Manual transmission	O	O	O	O	O	O	O	–	–	–
DCT	–	–	–	–	–	–	–	O	O	O
Left foot operated gearshift	O	O	O	O	O	–	–	–	–	–
ESP	–	–	–	–	–	O	O	–	–	–
EPS	–	O	–	O	O	–	O	–	O	O
Independent rear suspension	–	–	O	O	O	–	–	O	O	O
Rear hydraulic disc brake	–	–	O	O	O	–	–	O	O	O
Aluminum wheel	–	–	–	–	O	–	–	–	–	O

*1: '14 – '19, *2: '15 – '16, *3: '15 – '19

Be sure to refer to the procedure that pertains to the appropriate version of the TRX500.

After '19:

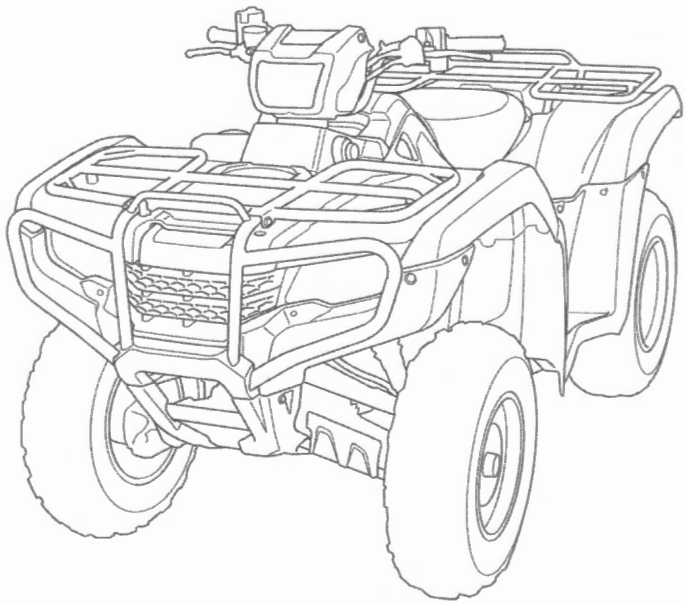
This manual covers 7 types of TRX520 models:

Model name	FM1	FM2	FM6	FE2	FA5	FA6	FA7
Manual transmission	O	O	O	O	–	–	–
DCT	–	–	–	–	O	O	O
Left foot operated gearshift	O	O	O	–	–	–	–
ESP	–	–	–	O	–	–	–
EPS	–	O	O	O	–	O	O
Independent rear suspension	–	–	O	–	O	O	O
Rear hydraulic disc brake	–	–	O	–	O	O	O
Aluminum wheel	–	–	–	–	–	–	O
EVAP*1	O	O	O	O	O	O	O

*1: AC type

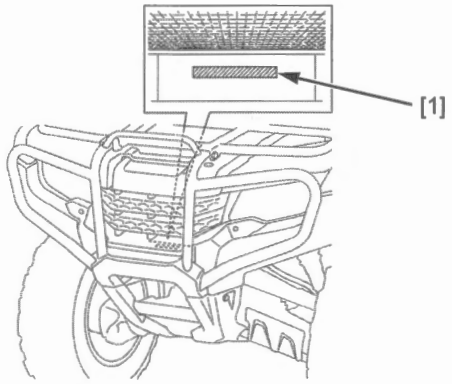
Be sure to refer to the procedure that pertains to the appropriate version of the TRX520.

'14 model shown:

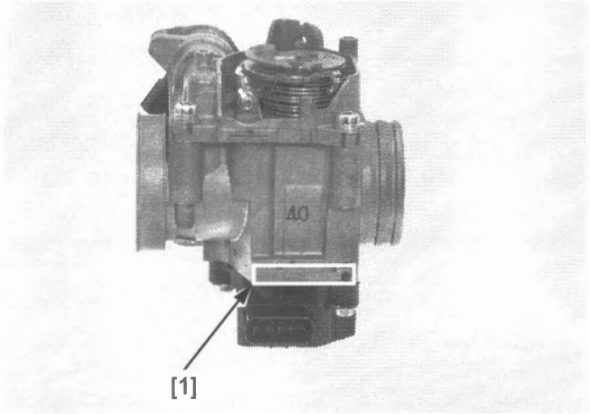


SERIAL NUMBERS/LABELS

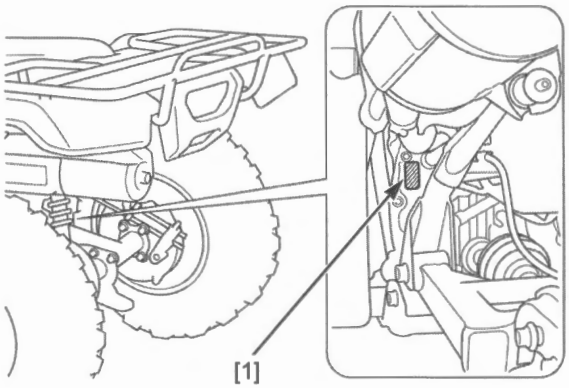
The Vehicle Identification Number (VIN) [1] is stamped on the front side of the frame through the front fender.



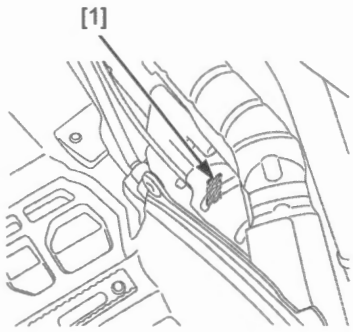
The throttle body identification number [1] is stamped on the lower side of the throttle body.



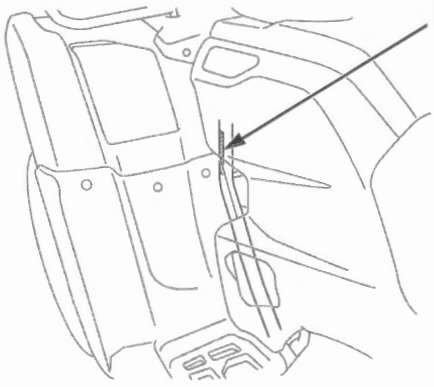
FM/FE models:
The engine serial number [1] is stamped on the left side of the rear crankcase.



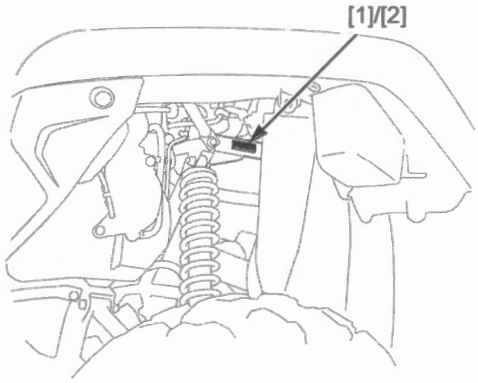
FA models:
The engine serial number [1] is stamped on the upper side of the rear crankcase.



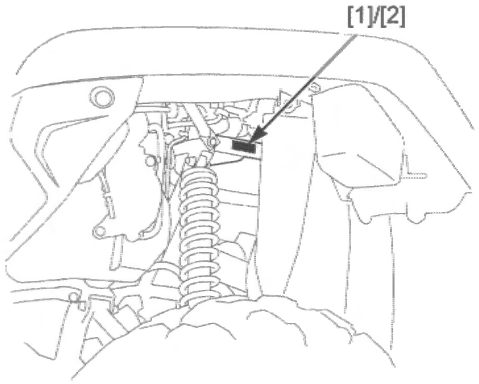
FM1/FM2/FE1/FE2 ('14 – '16):
The certification label [1] (AC type) or safety certification label [2] (CM type) is attached on the left front frame down pipe.



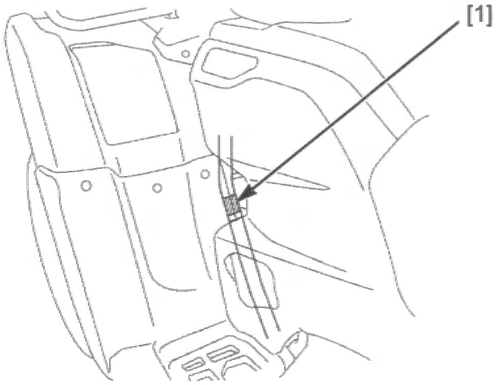
FM1/FM2/FE1/FE2 ('17 – '19) and FM5/FM6/FM7/FA5/FA6/FA7 ('15 – '19):
The certification label [1] (AC type) or safety certification label [2] (CM type) is attached on the left front frame pipe.



After '19:
The certification label [1] (except CM type) or safety certification label [2] (CM type) is attached on the left front frame pipe.

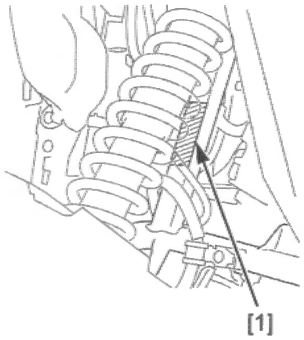


The color label [1] is attached on the left front frame down pipe. When ordering color-coded parts, always specify the designated color code.

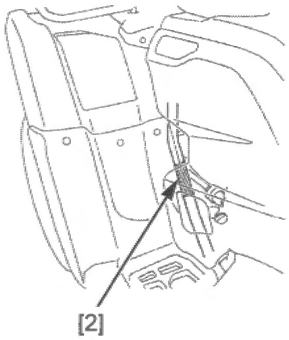


The vehicle emission control information label [1] and [2] (CM type only) is attached on the left front frame pipe.
- A, AC, CM, and III A types [1]
- CM type [2]

A, AC, CM, and III A types:



CM type:



SPECIFICATIONS

GENERAL SPECIFICATIONS

ITEM			SPECIFICATIONS
DIMENSIONS	Overall length	FM1/FM2/FE1/FE2	'14 – '19: 2,103 mm (82.8 in)
			After '19: 2,106 mm (82.9 in)
		FM5/FM6/FM7/FA5/FA6/FA7	'15 – '19: 2,147 mm (84.5 in)
		FM6/FA5/FA6/FA7	After '19: 2,185 mm (86.0 in)
	Overall width		1,205 mm (47.4 in)
	Overall height	FM1/FM2/FE1/FE2	'14 – '19: 1,219 mm (48.0 in)
			After '19: 1,213 mm (47.8 in)
		FM5/FM6/FM7/FA5/FA6/FA7	'15 – '19: 1,235 mm (48.6 in)
		FM6	After '19: 1,238 mm (48.7 in)
		FA5/FA6/FA7	After '20: 1,237 mm (48.7 in)
	Wheelbase	FM1/FM2/FE1/FE2	'14 – '19: 1,268 mm (49.9 in)
			After '19: 1,269 mm (50.0 in)
		FM5/FM6/FM7/FA5/FA6/FA7	'15 – '19: 1,292 mm (50.9 in)
		FM6/FA5/FA6/FA7	After '19: 1,294 mm (50.9 in)
	Front tread	FM1/FM2/FE1/FE2	'14 – '19: 910 mm (35.8 in)
			After '19: 905 mm (35.6 in)
		FM5/FM6/FM7/FA5/FA6/FA7	'15 – '19: 920 mm (36.2 in)
		FM6	After '19: 915 mm (36.0 in)
		FA5/FA6/FA7	After '19: 917 mm (36.1 in)
	Rear tread	FM1/FM2/FE1/FE2	920 mm (36.2 in)
		FM5/FM6/FM7/FA5/FA6/FA7	'15 – '19: 936 mm (36.9 in)
		FM6	After '19: 920 mm (36.2 in)
		FA5/FA6/FA7	After '19: 921 mm (36.3 in)
	Seat height	FM1/FM2/FE1/FE2	'14 – '19: 869 mm (34.2 in)
			After '19: 877 mm (34.5 in)
		FM5/FM6/FM7/FA5/FA6/FA7	'15 – '19: 909 mm (35.8 in)
		FM6	After '19: 924 mm (36.4 in)
		FA5/FA6/FA7	After '19: 922 mm (36.3 in)
	Footpeg height	FM1/FM2/FE1/FE2	'14 – '19: 358 mm (14.1 in)
			After '19: 366 mm (14.4 in)
		FM5/FM6/FM7/FA5/FA6/FA7	'15 – '19: 377 mm (14.8 in)
		FM6	After '19: 386 mm (15.2 in)
		FA5/FA6/FA7	After '19: 383 mm (15.1 in)
	Ground clearance	FM1/FM2/FE1/FE2	190 mm (7.5 in)
		FM5/FM6/FM7/FA5/FA6/FA7	'15 – '19: 239 mm (9.4 in)
		FM6	After '19: 250 mm (9.8 in)
		FA5/FA6/FA7	After '19: 247 mm (9.7 in)

ITEM				SPECIFICATIONS
DIMENSIONS	Curb weight	A	FM1	'20 – '21: 290 kg (639 lbs)
				After '21: 289 kg (637 lbs)
			FM2	After '20: 296 kg (653 lbs)
			FE2	'20 – '21: 297 kg (655 lbs)
				After '21: 296 kg (653 lbs)
			FM6	'20 – '21: 318 kg (701 lbs)
				After '21: 316 kg (697 lbs)
			FA5	'20 – '21: 324 kg (714 lbs)
				After '21: 322 kg (710 lbs)
			FA6	'20 – '21: 331 kg (729 lbs)
				After '21: 329 kg (701 lbs)
			FA7	'20 – '21: 327 kg (721 lbs)
				After '21: 326 kg (719 lbs)
		III A	FM1	289 kg (637 lbs)
		AC	FM1	'14 – '16: 286 kg (631 lbs)
				'17 – '19: 287 kg (633 lbs)
				After '19: 291 kg (642 lbs)
			FE1	286 kg (631 lbs)
			FM2	'14 – '19: 292 kg (644 lbs)
				'20 – '21: 298 kg (657 lbs)
				After '21: 297 kg (655 lbs)
			FE2	'14 – '19: 293 kg (646 lbs)
				After '19: 297 kg (655 lbs)
			FM5	307 kg (677 lbs)
			FM6	'15 – '19: 313 kg (690 lbs)
				'20 – '21: 319 kg (703 lbs)
				After '21: 317 kg (699 lbs)
			FM7	309 kg (681 lbs)
			FA5	'15 – '16: 319 kg (703 lbs)
				'17 – '19: 320 kg (705 lbs)
				'20 – '21: 325 kg (717 lbs)
				After '21: 323 kg (712 lbs)
			FA6	'15 – '16: 326 kg (719 lbs)
				'17 – '19: 327 kg (721 lbs)
				'20 – '21: 332 kg (732 lbs)
				After '21: 330 kg (728 lbs)
			FA7	'15 – '16: 323 kg (712 lbs)
				'17 – '19: 324 kg (714 lbs)
				'20 – '21: 329 kg (725 lbs)
				After '21: 327 kg (721 lbs)
		CM	FM1	'14 – '19: 287 kg (633 lbs)
				'20 – '21: 290 kg (639 lbs)
				After '21: 289 kg (637 lbs)
			FM2	293 kg (646 lbs)
			FE2	'14 – '19: 294 kg (648 lbs)
				After '19: 296 kg (653 lbs)
			FM5	308 kg (679 lbs)
			FM6	'15 – '19: 314 kg (692 lbs)
				'20 – '21: 318 kg (701 lbs)
				After '21: 316 kg (697 lbs)
			FM7	311 kg (686 lbs)
			FA6	'15 – '19: 327 kg (721 lbs)
				'20 – '21: 331 kg (730 lbs)
				After '21: 329 kg (725 lbs)
			FA7	'15 – '19: 325 kg (716 lbs)
				'20 – '21: 328 kg (723 lbs)
				After '21: 326 kg (719 lbs)
	Maximum weight capacity	FM1/FM2/FE1/FE2		250 kg (551 lbs)
		FM5/FM6/FM7/FA5/FA6/FA7		260 kg (573 lbs)

ITEM			SPECIFICATIONS
FRAME	Frame type		Double cradle
	Front suspension		Double wishbone
	Front wheel travel		185 mm (7.3 in)
	Front damper		Double tube
	Rear suspension	FM1/FM2/FE1/FE2	Swingarm (trailing type)
		FM5/FM6/FM7/FA5/FA6/FA7	Double wishbone
	Rear wheel travel	FM1/FM2/FE1/FE2	185 mm (7.3 in)
		FM5/FM6/FM7/FA5/FA6/FA7	215 mm (8.5 in)
	Rear damper		Double tube
	Front tire size		AT25 x 8-12 ★★
	Rear tire size		AT25 x 10-12 ★★
	Front rim size		12 x 6.0 AT
	Rear rim size		12 x 7.5 AT
	Front tire brand	FM1/FM2/FE1/FE2	M975 (MAXXIS)
		'14 – '21: FM5/FM6/FM7/FA5/FA6/FA7	MU25 (MAXXIS)
		After '21: FM6/FA5/FA6/FA7	M975 (MAXXIS)
	Rear tire brand	FM1/FM2/FE1/FE2	M978 (MAXXIS)
		'14 – '21: FM5/FM6/FM7/FA5/FA6/FA7	MU26 (MAXXIS)
		After '21: FM6/FA5/FA6/FA7	M978 (MAXXIS)
	Front brake		Hydraulic disc brake
	Rear brake	FM1/FM2/FE1/FE2	Mechanical drum brake
		FM5/FM6/FM7/FA5/FA6/FA7	Hydraulic disc brake
	Caster angle	FM1/FM2/FE1/FE2	2°
		FM5/FM6/FM7/FA5/FA6/FA7	1°
	Trail length	FM1/FM2/FE1/FE2	'14 – '19: 6.0 mm (1/4 in)
			After '19: 5.0 mm (3/16 in)
		FM5/FM6/FM7/FA5/FA6/FA7	– 1.0 mm (– 1/16 in)
	Front camber angle	FM1/FM2/FE1/FE2	'14 – '19: 0°
			After '19: 0.1°
		FM5/FM6/FM7/FA5/FA6/FA7	'15 – '19: 0.1°
			After '19: 0°
	Rear camber angle	FM5/FM6/FM7/FA5/FA6/FA7	'15 – '19: – 0.2°
			After '19: – 0.5°
	Fuel tank capacity		14.7 liters (3.88 US gal, 3.23 Imp gal)
	Fuel tank reserve capacity		4.9 liters (1.29 US gal, 1.08 Imp gal)

ITEM				SPECIFICATIONS
ENGINE	Cylinder arrangement			Single cylinder, longitudinally installed
	Bore and stroke			'14 – '19: 92.0 x 71.5 mm (3.62 x 2.81 in)
				After '19: 96.0 x 71.5 mm (3.78 x 2.81 in)
	Displacement			'14 – '19: 475 cm³ (29.0 cu-in)
				After '19: 518 cm³ (31.6 cu-in)
	Compression ratio			9.5:1
	Valve train			OHV
	Intake valve	opens: at 1 mm (0.04 in) lift	'14 – '19: FM/FE models	9° BTDC
			After '19: FM/FE models	5° BTDC
			FA models	
		closes: at 1 mm (0.04 in) lift	'14 – '19: FM/FE models	46° ABDC
			After '19: FM/FE models	50° ABDC
			FA models	
	Exhaust valve	opens: at 1 mm (0.04 in) lift	'14 – '19: FM/FE models	46° BBDC
			After '19: FM/FE models	42° BBDC
			FA models	
		closes: at 1 mm (0.04 in) lift	'14 – '19: FM/FE models	4° ATDC
			After '19: FM/FE models	8° ATDC
			FA models	
	Lubrication system			Forced pressure and wet sump
	Oil pump type			Trochoid
	Cooling system			Liquid cooled
	Air filtration			Oiled double urethane foam
	Engine dry weight	AC ('14 – '19)	FM1/FM2	51.4 kg (113.3 lbs)
			FE1/FE2	52.4 kg (115.5 lbs)
			FM5/FM6/FM7	51.4 kg (113.3 lbs)
			FA5/FA6/FA7	62.1 kg (136.9 lbs)
		CM ('14 – '19)	FM1/FM2	51.4 kg (113.3 lbs)
			FE2	52.4 kg (115.5 lbs)
			FM5/FM6/FM7	52.5 kg (115.7 lbs)
			FA6/FA7	63.2 kg (139.3 lbs)
		All types (After '19)	FM1/FM2	51.5 kg (113.5 lbs)
			FE2	52.8 kg (116.4 lbs)
			FM6	51.7 kg (113.9 lbs)
			FA5/FA6/FA7	62.1 kg (136.9 lbs)
FUEL DELIVERY SYSTEM	Type			PGM-FI
	Throttle bore			36 mm (1.4 in)
DRIVE TRAIN (FM/FE models)	Clutch system			Centrifugal and multi-plate, wet
	Clutch operation system			Automatic
	Transmission			Constant mesh, 5-speeds with reverse
	Primary reduction			2.103 (61/29)
	Secondary reduction			1.875 (30/16)
	Final reduction		Front	3.230 (42/13)
			Rear	3.153 (41/13)
	Gear ratio		1st	4.230 (55/13)
			2nd	2.388 (43/18)
			3rd	1.608 (37/23)
			4th	1.178 (33/28)
			5th	0.848 (28/33)
			Reverse	5.743 (48/13 x 28/18)
	Gearshift pattern		Pattern	R – N – 1 – 2 – 3 – 4 – 5
			FM models	Left foot operated return system
			FE models	Electric shift (left hand operated) return system

ITEM			SPECIFICATIONS
DRIVE TRAIN (FA models)	Clutch system		Centrifugal and 2 multi-plate wet clutches
	Clutch operation system		Automatic
	Transmission		Automatic, 5-speeds with reverse
	Primary reduction		2.680 (67/25)
	Secondary reduction		1.520 (38/25)
	Final reduction	Front	3.230 (42/13)
		Rear	3.153 (41/13)
	Transmission gear ratio	1st	3.058 (52/17)
		2nd	2.157 (41/19)
		3rd	1.588 (27/17)
		4th	1.181 (26/22)
		5th	0.848 (28/33)
		Reverse	3.996 (45/16 x 27/19)
	Transmission gearshift pattern		R – N – 1 – 2 – 3 – 4 – 5 Automatic and Electric shift (left hand operated) return system
	Sub transmission gear ratio	L	2.187 (35/16)
		D	1.520 (38/25)
	Sub transmission gearshift pattern		L – D Lever operated system
ELECTRICAL	Ignition system		Full transistorized ignition
	Starting system	A/AC	Electric starter motor
		CM/ III A	Electric starter motor and emergency recoil stater
	Charging system		Triple phase output alternator
	Regulator/rectifier		FET shorted, triple phase full wave rectification
	Lighting system		Battery

PGM-FI SYSTEM SPECIFICATIONS

ITEM	SPECIFICATIONS
IAT sensor resistance (40°C/104°F)	2.2 – 2.7 kΩ
ECT sensor resistance (20°C/68°F)	1.0 – 1.3 kΩ
Fuel injector resistance (20°C/68°F)	11.1 – 12.3 Ω

IGNITION SYSTEM SPECIFICATIONS

ITEM	SPECIFICATIONS
Spark plug	BKR5E-11 (NGK), K16PR-U11 (DENSO)
Spark plug gap	1.0 – 1.1 mm (0.039 – 0.043 in)
Ignition coil primary peak voltage	100 V minimum
Ignition pulse generator peak voltage	0.7 V minimum
Ignition timing ("F" mark)	10° BTDC at idle

FUEL SYSTEM SPECIFICATIONS

ITEM			SPECIFICATIONS
Throttle body identification number	'14 – '19		GQ3QA
	'20 – '21	Except AC types	GQ3DC
		AC type	GQ3DG
	After '21	Except AC types	GQ37B
		AC type	GQ37A
Idle speed			1,400 ± 100 rpm
Throttle lever freeplay			3 – 8 mm (1/8 – 5/16 in)
Fuel pressure at idle			331 – 367 kPa (3.4 – 3.7 kgf/cm^2, 48 – 53 psi)
Fuel pump flow (at 12 V)			356 cm^3 (12.0 US oz, 12.5 Imp oz) minimum/10 seconds
EVAP purge control solenoid valve resistance (20°C/68°F) (After '19 AC type)			30 – 34 Ω

COOLING SYSTEM SPECIFICATIONS ('14)

ITEM		SPECIFICATIONS
Coolant capacity	Radiator and engine	1.54 liters (1.63 US qt, 1.36 Imp qt)
	Reserve tank	0.15 liter (0.16 US qt, 0.13 Imp qt)
Radiator cap relief pressure		108 – 137 kPa (1.1 – 1.4 kgf/cm^2, 16 – 20 psi)
Thermostat	Begin to open	80 – 84°C (176 – 183°F)
	Fully open	95°C (203°F)
	Valve lift	8 mm (0.3 in) minimum at 95°C (203°F)
Recommended antifreeze		Pro Honda HP Coolant or an equivalent high quality ethylene glycol antifreeze containing corrosion protection inhibitors
Standard coolant concentration		1:1 mixture with distilled water

COOLING SYSTEM SPECIFICATIONS (After '14)

ITEM		SPECIFICATIONS
Coolant capacity	Radiator and engine	1.6 liters (1.7 US qt, 1.4 Imp qt)
	Reserve tank	0.15 liter (0.16 US qt, 0.13 Imp qt)
Radiator cap relief pressure		108 – 137 kPa (1.1 – 1.4 kgf/cm^2, 16 – 20 psi)
Thermostat	Begin to open	80 – 84°C (176 – 183°F)
	Fully open	95°C (203°F)
	Valve lift	8 mm (0.3 in) minimum at 95°C (203°F)
Recommended antifreeze		High quality ethylene glycol antifreeze containing silicate free corrosion inhibitors
Standard coolant concentration		1:1 mixture with distilled water

LUBRICATION SYSTEM SPECIFICATIONS

Unit: mm (in)

ITEM			STANDARD	SERVICE LIMIT
Engine oil capacity	FM/FE models	After draining	2.9 liters (3.1 US qt, 2.6 Imp qt)	–
		After draining/filter change	3.0 liters (3.2 US qt, 2.6 Imp qt)	–
		After disassembly	3.3 liters (3.5 US qt, 2.9 Imp qt)	–
	FA models	After draining	3.6 liters (3.8 US qt, 3.2 Imp qt)	–
		After draining/filter change	3.8 liters (4.0 US qt, 3.3 Imp qt)	–
		After disassembly	4.4 liters (4.6 US qt, 3.8 Imp qt)	–
Recommended engine oil			Pro Honda GN4 4-stroke oil (U.S.A. and Canada) or equivalent motorcycle oil API service classification: SG or higher (except oils labeled as energy conserving on the circular API service label) JASO T 903 standard: MA Viscosity: SAE 10W-30	–
Oil pressure at 5,000 rpm (80°C/176°F)			510 kPa (5.2 kgf/cm^2, 74 psi)	–
Oil pump		Tip clearance	0.15 (0.006)	0.20 (0.008)

CYLINDER HEAD/VALVE SPECIFICATIONS

Unit: mm (in)

ITEM			STANDARD	SERVICE LIMIT
Cylinder compression at 450 rpm			680 kPa (6.9 kgf/cm³, 99 psi)	–
Valve clearance		IN	0.15 ± 0.02 (0.006 ± 0.001)	–
		EX	0.23 ± 0.02 (0.009 ± 0.001)	–
Valve, valve guide	Valve stem O.D.	IN	5.975 – 5.990 (0.2352 – 0.2358)	5.95 (0.234)
		EX	5.955 – 5.970 (0.2344 – 0.2350)	5.93 (0.233)
	Valve guide I.D.	IN/EX	6.000 – 6.012 (0.2362 – 0.2367)	6.02 (0.237)
	Valve guide projection above cylinder head	IN/EX	14.8 – 15.0 (0.58 – 0.59)	–
	Valve seat width	IN/EX	1.2 (0.05)	1.5 (0.06)
Valve spring	Free length	Inner	42.94 (1.691)	42.08 (1.657)
		Outer	43.63 (1.718)	42.76 (1.683)
Rocker arm	Arm I.D.	IN/EX	12.000 – 12.018 (0.4724 – 0.4731)	12.05 (0.474)
	Shaft O.D.	IN/EX	11.966 – 11.984 (0.4711 – 0.4718)	–
Camshaft and cam follower	Cam lobe height	IN	35.9400 – 36.1800 (1.41496 – 1.42441)	35.74 (1.407)
		EX	35.6811 – 35.9211 (1.40476 – 1.41421)	35.48 (1.397)
	Cam follower O.D.	IN/EX	22.467 – 22.482 (0.8845 – 0.8851)	22.46 (0.884)
	Follower bore I.D.	IN/EX	22.510 – 22.526 (0.8862 – 0.8868)	22.54 (0.887)
Cylinder head warpage			–	0.10 (0.004)

CYLINDER/PISTON SPECIFICATIONS ('14 – '19)

Unit: mm (in)

ITEM			STANDARD	SERVICE LIMIT
Cylinder	I.D.		92.000 – 92.010 (3.6220 – 3.6224)	92.10 (3.626)
	Out-of-round		–	0.10 (0.004)
Piston, piston pin, piston ring	Piston O.D. at 15 (0.6) from bottom		91.970 – 91.990 (3.6209 – 3.6216)	91.90 (3.618)
	Piston pin hole I.D.		19.002 – 19.008 (0.7481 – 0.7483)	19.04 (0.750)
	Piston pin O.D.		18.994 – 19.000 (0.7478 – 0.7480)	18.96 (0.746)
	Piston ring end gap	Top	0.15 – 0.30 (0.006 – 0.012)	0.5 (0.02)
		Second	0.30 – 0.45 (0.012 – 0.018)	0.6 (0.02)
		Oil (side rail)	0.20 – 0.70 (0.008 – 0.028)	0.9 (0.04)
	Piston ring-to-ring groove clearance	Top	0.030 – 0.060 (0.0012 – 0.0024)	0.09 (0.004)
		Second	0.030 – 0.060 (0.0012 – 0.0024)	0.09 (0.004)
Connecting rod small end I.D.			19.020 – 19.041 (0.7488 – 0.7496)	19.07 (0.751)

CYLINDER/PISTON SPECIFICATIONS (After '19)

Unit: mm (in)

ITEM			STANDARD	SERVICE LIMIT
Cylinder	I.D.		96.000 – 96.010 (3.7795 – 3.7799)	96.10 (3.783)
Piston, piston pin, piston ring	Piston O.D. at 15 (0.6) from bottom		95.965 – 95.985 (3.7781 – 3.7789)	95.89 (3.775)
	Piston pin hole I.D.		19.002 – 19.008 (0.7481 – 0.7483)	19.04 (0.750)
	Piston pin O.D.		18.994 – 19.000 (0.7478 – 0.7480)	18.96 (0.746)
	Piston ring end gap	Top	0.15 – 0.30 (0.006 – 0.012)	0.5 (0.02)
		Second	0.30 – 0.45 (0.012 – 0.018)	0.6 (0.02)
		Oil (side rail)	0.20 – 0.70 (0.008 – 0.028)	0.9 (0.04)
	Piston ring-to-ring groove clearance	Top	0.030 – 0.060 (0.0012 – 0.0024)	–
		Second	0.030 – 0.060 (0.0012 – 0.0024)	–
Connecting rod small end I.D.			19.020 – 19.041 (0.7488 – 0.7496)	19.07 (0.751)

CLUTCH/GEARSHIFT LINKAGE SPECIFICATIONS (FM/FE models)

Unit: mm (in)

ITEM			STANDARD	SERVICE LIMIT
Centrifugal clutch	Drum I.D.		150.0 – 150.2 (5.906 – 5.913)	150.4 (5.92)
	Weight lining thickness		2.0 (0.08)	1.3 (0.05)
	Clutch spring height		2.96 (0.117)	2.84 (0.112)
	Clutch weight spring free length		24.72 (0.973)	25.7 (1.01)
Change clutch	Spring free length	FM1/FM2	52.2 (2.06)	50.7 (2.00)
		FE1/FE2	46.8 (1.84)	45.3 (1.78)
	Disc thickness		2.62 – 2.78 (0.103 – 0.109)	2.3 (0.09)
	Plate warpage		–	0.20 (0.008)
	Outer I.D.		29.000 – 29.021 (1.1417 – 1.1426)	–
	Outer guide	I.D.	22.000 – 22.021 (0.8661 – 0.8670)	–
		O.D.	28.959 – 28.980 (1.1401 – 1.1409)	–
	Mainshaft O.D. at clutch outer guide		21.967 – 21.980 (0.8648 – 0.8654)	–
Primary drive gear	Gear I.D.		29.000 – 29.021 (1.1417 – 1.1426)	29.05 (1.144)
	Crankshaft O.D. at drive gear		28.959 – 28.980 (1.1401 – 1.1409)	28.93 (1.139)

DUAL CLUTCH TRANSMISSION SPECIFICATIONS (FA models)

Unit: mm (in)

ITEM			STANDARD	SERVICE LIMIT
Centrifugal clutch	Drum I.D.		140.0 – 140.2 (5.512 – 5.520)	140.4 (5.53)
	Weight lining thickness		2.0 (0.08)	1.3 (0.05)
	Clutch spring height		3.8 (0.15)	3.68 (0.145)
	Clutch weight spring free length		24.65 (0.970)	25.6 (1.01)
Oil pressure at 5,000 rpm (80°C/176°F)		Line	510 kPa (5.2 kgf/cm^2, 74 psi)	–
		Shift clutch	510 kPa (5.2 kgf/cm^2, 74 psi)	–
Shift clutch	Initial clearance	1st	0.70 – 0.90 (0.028 – 0.035)	–
		2nd	0.65 – 0.95 (0.026 – 0.037)	–
	Disc thickness		1.88 – 2.00 (0.074 – 0.079)	worn out lining
	Plate thickness		1.55 – 1.65 (0.061 – 0.065)	discoloration
Primary drive gear	Gear I.D.		29.000 – 29.021 (1.1417 – 1.1426)	–
	Crankshaft O.D. at drive gear		28.959 – 28.980 (1.1401 – 1.1409)	–

SUB-TRANSMISSION SPECIFICATIONS (FA models)

Unit: mm (in)

ITEM			STANDARD	SERVICE LIMIT
Shift fork	Claw thickness		4.93 – 5.00 (0.194 – 0.197)	–
Transmission	Gear I.D.	Low, drive	23.000 – 23.021 (0.9055 – 0.9063)	–
	Gear bushing O.D.	Low, drive	22.959 – 22.980 (0.9039 – 0.9047)	–
	Gear bushing I.D.	Low, drive	20.000 – 20.021 (0.7874 – 0.7882)	–
	Sub-transmission shaft O.D.	at Low, drive	19.959 – 19.980 (0.7858 – 0.7866)	–

ALTERNATOR/STARTER CLUTCH SPECIFICATIONS

Unit: mm (in)

ITEM		STANDARD	SERVICE LIMIT
Starter driven gear boss	O.D.	51.705 – 51.718 (2.0356 – 2.0361)	–
	I.D.	31.946 – 31.962 (1.2577 – 1.2583)	–
Crankshaft O.D. at starter driven gear		31.884 – 31.900 (1.2553 – 1.2559)	31.85 (1.254)

CRANKCASE/TRANSMISSION/CRANKSHAFT/BALANCER SPECIFICATIONS

FM/FE models:

Unit: mm (in)

ITEM			STANDARD	SERVICE LIMIT
Reverse selector lever freeplay (Except After '19 FE2)			2 – 4 (3/32 – 5/32)	–
Shift fork	I.D.	Front, rear	13.000 – 13.021 (0.5118 – 0.5126)	–
		Center	13.000 – 13.018 (0.5118 – 0.5125)	–
	Claw thickness		4.93 – 5.00 (0.194 – 0.197)	–
	Shaft O.D.		12.966 – 12.984 (0.5105 – 0.5112)	–
Transmission	Gear I.D.	M3	25.000 – 25.021 (0.9843 – 0.9851)	–
		M5	20.000 – 20.021 (0.7874 – 0.7882)	–
		C1, C2, C4, CR	28.020 – 28.041 (1.1031 – 1.1040)	–
		Reverse idle	13.000 – 13.021 (0.5118 – 0.5126)	–
	Gear bushing O.D.	M3	24.959 – 24.980 (0.9826 – 0.9835)	–
		M5	19.966 – 19.984 (0.7861 – 0.7868)	–
		C2	27.984 – 28.005 (1.1017 – 1.1026)	–
		C1, C4, CR	27.979 – 28.000 (1.1015 – 1.1024)	–
	Gear bushing I.D.	M3	22.000 – 22.021 (0.8661 – 0.8670)	–
		M5	17.016 – 17.034 (0.6699 – 0.6706)	–
		C4	25.000 – 25.021 (0.9843 – 0.9851)	–
	Mainshaft O.D.	at M3	21.959 – 21.980 (0.8645 – 0.8654)	–
		at M5	16.976 – 16.987 (0.6683 – 0.6688)	–
	Countershaft O.D.	at C4	24.959 – 24.980 (0.9826 – 0.9835)	–
	Reverse idle shaft O.D.		12.966 – 12.984 (0.5105 – 0.5112)	–
Crankshaft	Runout		–	0.15 (0.006)
	Big end side clearance		0.05 – 0.65 (0.002 – 0.026)	0.8 (0.03)
	Big end radial clearance		0.006 – 0.018 (0.0002 – 0.0007)	0.05 (0.002)

FA models:

Unit: mm (in)

ITEM			STANDARD	SERVICE LIMIT
Reverse selector lever freeplay ('15 – '19)			2 – 4 (3/32 – 5/32)	–
Shift fork	I.D.		13.000 – 13.018 (0.5118 – 0.5125)	–
	Claw thickness		5.93 – 6.00 (0.233 – 0.236)	–
	Shaft O.D.		12.966 – 12.984 (0.5105 – 0.5112)	–
Transmission	Gear I.D.	M1	20.000 – 20.021 (0.7874 – 0.7882)	–
		M3	25.000 – 25.021 (0.9843 – 0.9851)	–
		C2, C4, CR	28.020 – 28.041 (1.1031 – 1.1040)	–
		C5	31.000 – 31.025 (1.2205 – 1.2215)	–
		Reverse idle	13.000 – 13.018 (0.5118 – 0.5125)	–
	Gear bushing O.D.	M1	19.966 – 19.984 (0.7861 – 0.7868)	–
		M3	24.959 – 24.980 (0.9826 – 0.9835)	–
		C2/CR	27.979 – 28.000 (1.1015 – 1.1024)	–
		C4	27.984 – 28.005 (1.1017 – 1.1026)	–
		C5	30.950 – 30.975 (1.2185 – 1.2195)	–
	Gear bushing I.D.	M1	17.000 – 17.018 (0.6692 – 0.6700)	–
		M3	22.000 – 22.021 (0.8661 – 0.8670)	–
		C2/CR	25.000 – 25.013 (0.9843 – 0.9848)	–
		C5	28.000 – 28.021 (1.1024 – 1.1032)	–
	Mainshaft O.D.	at M1	16.976 – 16.987 (0.6683 – 0.6688)	–
		at M3	21.959 – 21.980 (0.8645 – 0.8654)	–
	Countershaft O.D.	at C2/CR	24.959 – 24.980 (0.9826 – 0.9835)	–
		at C5	27.959 – 27.980 (1.1007 – 1.1016)	–
	Reverse idle shaft O.D.		12.966 – 12.984 (0.5105 – 0.5112)	–
Crankshaft	Runout		–	0.15 (0.006)
	Big end side clearance		0.05 – 0.65 (0.002 – 0.026)	0.8 (0.03)
	Big end radial clearance		0.006 – 0.018 (0.0002 – 0.0007)	0.05 (0.002)

FRONT WHEEL/SUSPENSION/STEERING SPECIFICATIONS

Unit: mm (in)

ITEM			STANDARD	SERVICE LIMIT
Cold tire pressure		Standard	30 kPa (0.30 kgf/cm^2, 4.4 psi)	–
		With cargo	30 kPa (0.30 kgf/cm^2, 4.4 psi)	–
Tie-rod distance between the ball joints		FM1/FM2/FE models	387.9 (15.27)	–
		FM5/FM6/FM7/FA models	388.4 (15.29)	–
Toe	'14 – '19	All models	Toe-out: 25 ± 15 (1.0 ± 0.6)	–
	After '19	FM1/FM2/FE2	Toe-out: 9.0 ± 15 (3/8 ± 19/32)	–
		FM6	Toe-out: 1.0 ± 15 (1/16 ± 19/32)	–
		FA5/FA6/FA7	Toe-out: 8.0 ± 15 (5/16 ± 19/32)	–

REAR WHEEL/SUSPENSION SPECIFICATIONS

ITEM		STANDARD	SERVICE LIMIT
Cold tire pressure	Standard	30 kPa (0.30 kgf/cm^2, 4.4 psi)	–
	With cargo	30 kPa (0.30 kgf/cm^2, 4.4 psi)	–

BRAKE SYSTEM SPECIFICATIONS

Unit: mm (in)

ITEM		STANDARD	SERVICE LIMIT
Front brake	Recommended brake fluid	Honda DOT 4 brake fluid	–
	Disc thickness	3.3 – 3.7 (0.13 – 0.15)	3.0 (0.12)
	Disc runout	–	0.30 (0.012)
	Master cylinder I.D.	14.000 – 14.043 (0.5512 – 0.5529)	–
	Master piston O.D.	13.957 – 13.984 (0.5495 – 0.5506)	–
	Caliper cylinder I.D.	32.030 – 32.080 (1.2610 – 1.2630)	–
	Caliper piston O.D.	31.948 – 31.998 (1.2578 – 1.2598)	–
Rear brake (FM1/FM2/FE1/FE2)	Rear (parking) brake lever freeplay	15 – 20 (19/32 – 25/32)	–
	Rear brake pedal freeplay	15 – 20 (19/32 – 25/32)	–
	Rear brake drum I.D.	160.0 – 160.2 (6.30 – 6.31)	161.0 (6.34)
Rear brake (FM5/FM6/FM7/FA5/FA6/FA7)	Rear (parking) brake lever freeplay	25 – 30 (1 – 1 3/16)	–
	Recommended brake fluid	Honda DOT 4 brake fluid	–
	Disc thickness	7.3 – 7.7 (0.29 – 0.30)	6.0 (0.24)
	Disc runout	–	0.30 (0.012)
	Master cylinder I.D.	15.870 – 15.913 (0.6248 – 0.6265)	–
	Master piston O.D.	15.827 – 15.854 (0.6231 – 0.6242)	–
	Caliper cylinder I.D.	30.230 – 30.280 (1.1902 – 1.1921)	–
	Caliper piston O.D.	30.165 – 30.198 (1.1876 – 1.1889)	–

FRONT DRIVING MECHANISM SPECIFICATIONS

Unit: mm (in)

ITEM			STANDARD	SERVICE LIMIT
Front final drive	Oil capacity	After draining	325 cm^3 (11.0 US oz, 11.4 Imp oz)	–
		After disassembly	370 cm^3 (12.5 US oz, 13.0 Imp oz)	–
	Recommended oil		Honda shaft drive oil or equivalent hypoid gear oil, SAE 80W90	–
	Gear backlash		0.05 – 0.25 (0.002 – 0.010)	0.4 (0.02)
	Backlash difference		–	0.2 (0.01)
	Slip torque		14 – 17 N·m (1.45 – 1.75 kgf·m, 10 – 13 lbf·ft)	12 N·m (1.2 kgf·m, 9 lbf·ft)
	Face cam-to-housing distance		3.3 – 3.7 (0.13 – 0.15)	3.3 (0.13)
	Differential ring gear depth		6.55 – 6.65 (0.258 – 0.262)	6.55 (0.258)
	Cone spring free height		2.8 (0.11)	2.6 (0.10)

REAR DRIVING MECHANISM SPECIFICATIONS

Unit: mm (in)

ITEM			STANDARD	SERVICE LIMIT
Axle runout (FM1/FM2/FE1/FE2)			–	3.0 (0.12)
Rear final drive	Oil capacity (FM1/FM2/FE1/FE2)	After draining	85 cm³ (2.9 US oz, 3.0 Imp oz)	–
		After disassembly	100 cm³ (3.4 US oz, 3.5 Imp oz)	–
	Oil capacity (FM5/FM6/FM7/FA5/FA6/FA7)	After draining	125 cm³ (4.2 US oz, 4.4 Imp oz)	–
		After disassembly	145 cm³ (4.9 US oz, 5.5 Imp oz)	–
	Recommended oil		Honda shaft drive oil or equivalent hypoid gear oil, SAE 80W90	–
	Gear backlash		0.05 – 0.25 (0.002 – 0.010)	0.4 (0.02)
	Backlash difference		–	0.2 (0.01)
	Ring gear-to-stop pin clearance		0.3 – 0.6 (0.01 – 0.02)	–

BATTERY/CHARGING SYSTEM SPECIFICATIONS

ITEM			SPECIFICATIONS
Battery	Type		GYZ16H
	Capacity		12 V – 16 Ah (10 HR)/12 V – 16.8 Ah (20 HR)
	Current leakage	FM1/FM2/FE1/FE2 ('14 – '19)	1 mA max.
		FM1/FM2/FE2 (After '19)	0.31 mA max.
		FM5/FM6/FM7/FA5/FA6/FA7	
	Voltage (20°C/68°F)	Fully charged	13.0 – 13.2 V
		Needs charging	Below 12.4 V
	Charging current	Normal	1.6 A x 5 – 10 h
		Quick	8.0 A x 1.0 h
Alternator	Capacity	FM/FE models	0.481 kW/5,000 rpm
		FA models	0.595 kW/5,000 rpm
	Charging coil resistance (20°C/68°F)		0.1 – 1.0 Ω

LIGHTS/METERS/SWITCHES SPECIFICATIONS

ITEM			SPECIFICATIONS
Bulbs	Headlight (high/low beam)		12 V - 35/35 W x 2
	Assist headlight	FM1/FM2/FE1/FE2 ('14 – '19)	12 V - 45 W
		FM5/FM6/FM7/FA5/FA6/FA7 ('15 – '19)	12 V - 50 W
		All models (After '19)	
	Brake/taillight		LED
	Neutral indicator		LED
	Reverse indicator		LED
	High coolant temperature indicator		LED
	MIL		LED
	Meter light		LED
	EPS indicator (FM2/FM6/FM7/FE2/FA6/FA7)		LED
	Differential lock indicator		LED
Fuse	Main fuse		40 A
	Sub-fuse	FM models	20 A x 4, 10 A x 2
		FE/FA models	30 A x 1, 20 A x 3, 10 A x 2
	EPS fuse	FM2/FE2/FM6/FM7/FA6/FA7	40 A

TORQUE VALUES

STANDARD TORQUE VALUES

FASTENER TYPE	TORQUE N·m (kgf·m, lbf·ft)	FASTENER TYPE	TORQUE N·m (kgf·m, lbf·ft)
5 mm bolt and nut	5.2 (0.5, 3.8)	5 mm screw	4.2 (0.4, 3.1)
6 mm bolt and nut (Include SH flange bolt)	10 (1.0, 7)	6 mm screw	9 (0.9, 6.6)
		6 mm flange bolt and nut (Include 8 mm head, large flange bolt)	12 (1.2, 9)
8 mm bolt and nut	22 (2.2, 16)		
10 mm bolt and nut	34 (3.5, 25)	8 mm flange bolt and nut	27 (2.8, 20)
12 mm bolt and nut	54 (5.5, 40)	10 mm flange bolt and nut	39 (4.0, 29)

ENGINE & FRAME TORQUE VALUES

- Torque specifications listed below are for important fasteners.
- Others should be tightened to standard torque values listed above.

FRAME/BODY PANELS/EXHAUST SYSTEM

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Step bracket nut	8	8	32 (3.3, 24)	
Muffler cover bolt	2	6	12 (1.2, 9)	
Exhaust pipe cover band screw	2	–	2.0 (0.2, 1.5)	
Exhaust pipe cover rear band screw (FM5/FM6/FM7/FA5/FA6/FA7)	1	–	3.2 (0.3, 2.4)	
Front muffler cover band screw (FM1/FM2/FE1/FE2)	1	–	2.0 (0.2, 1.5)	
Front muffler cover band screw (FM5/FM6/FM7/FA5/FA6/FA7)	1	–	3.2 (0.3, 2.4)	
Muffler cover band screw	2	–	3.2 (0.3, 2.4)	
Exhaust pipe stud bolt	2	8	6 (0.6, 4.4)	See page 2-17

MAINTENANCE

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Spark plug	1	14	22 (2.2, 16)	
Valve adjusting screw lock nut	2	6	17 (1.7, 13)	
Valve adjusting hole cap	2	36	12 (1.2, 9)	
Timing hole cap	1	14	10 (1.0, 7)	
Engine oil drain bolt	1	12	25 (2.5, 18)	
Rear final gear case oil check bolt (FM1/FM2/FE1/FE2)	1	8	12 (1.2, 9)	
Rear final gear case oil filler cap	1	30	12 (1.2, 9)	
Rear final gear case oil drain bolt	1	8	12 (1.2, 9)	
Front final gear case oil filler cap	1	30	12 (1.2, 9)	
Front final gear case oil drain bolt	1	8	12 (1.2, 9)	
Range select cable lock nut (FA5/ FA6/FA7)	2	14	26 (2.7, 19)	
Front master cylinder reservoir cap screw	2	4	2.0 (0.2, 1.5)	
Rear brake master cylinder push rod joint lock nut (FM5/FM6/FM7/FA5/ FA6/FA7)	1	8	17 (1.7, 13)	
Tie-rod lock nut (knuckle side)	2	12	54 (5.5, 40)	See page 3-31
Tie-rod lock nut (steering arm side)	2	12	54 (5.5, 40)	Left hand threads. See page 3-31

PGM-FI SYSTEM

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Sensor unit torx screw (T25)	3	5	3.4 (0.3, 2.5)	
ECT sensor	1	10	12 (1.2, 9)	
Bank angle sensor mounting bolt	2	6	10 (1.0, 7)	
O_2 sensor	1	12	24.5 (2.5, 18)	

IGNITION SYSTEM

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Timing hole cap	1	14	10 (1.0, 7)	

ELECTRIC STARTER

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Starter motor case bolt	2	5	4.9 (0.5, 3.6)	
Negative brush set screw	1	5	3.7 (0.4, 2.7)	

FUEL SYSTEM

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Harness clip stay screw	1	5	3.4 (0.3, 2.5)	
Fuel hose clamp stay screw	1	5	3.4 (0.3, 2.5)	
Insulator band screw (Cylinder head side)	1	5	–	See page 7-21
Insulator band screw (Throttle body side)	1	5	–	See page 7-22
Throttle drum cover screw	1	4	1.8 (0.2, 1.3)	
IACV torx screw (T20)	2	4	2.1 (0.2, 1.5)	
Fuel injector mounting bolt	2	5	5.1 (0.5, 3.8)	

COOLING SYSTEM

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Water hose band screw	8	–	–	See page 8-8
Cooling fan nut	1	5	2.7 (0.3, 2.0)	Apply locking agent to the threads.
Fan motor bolt	3	5	5.2 (0.5, 3.8)	
Fan motor stay bolt	3	6	8.4 (0.9, 6.2)	

CYLINDER HEAD/VALVE

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Cylinder head nut	4	10	48 (4.9, 35)	Apply engine oil to the threads and seating surface.
Upper engine hanger nut (frame side)	1	10	63 (6.4, 46)	
Upper engine hanger bolt (engine side)	2	8	32 (3.3, 24)	
Cam chain tensioner pivot bolt	1	6	12 (1.2, 9)	Apply locking agent to the threads. Coating width: 8.0 ± 1.0 mm (0.31 ± 0.04 in) except 2.0 ± 1.0 mm (0.08 ± 0.04 in) from tip
Spark plug	1	14	22 (2.2, 16)	
ECT sensor	1	10	12 (1.2, 9)	

CYLINDER/PISTON

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Cylinder stud bolt	4	10	12 (1.2, 9)	See page 11-5

CLUTCH/GEARSHIFT LINKAGE (FM/FE models)

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Centrifugal clutch lock nut	1	20	118 (12.0, 87)	Lock nut: replace with a new one. Apply engine oil to the threads and seating surface. Stake.
Change clutch lock nut	1	18	108 (11.0, 80)	Lock nut: replace with a new one. Apply engine oil to the threads and seating surface. Stake.
Clutch spring bolt	4	6	13 (1.3, 10)	
Gearshift spindle return spring pin	1	8	22 (2.2, 16)	Apply locking agent to the threads. Coating width: 6.5 ± 1.0 mm (0.26 ± 0.04 in) except 3.0 – 4.0 mm (0.12 – 0.16 in) from tip
Gearshift cam bolt	1	6	16 (1.6, 12)	Apply locking agent to the threads. Coating width: 6.5 ± 1.0 mm (0.26 ± 0.04 in) except 3.0 – 4.0 mm (0.12 – 0.16 in) from tip
Shift drum stopper arm pivot bolt	1	6	12 (1.2, 9)	Apply locking agent to the threads. Coating width: 8.0 ± 1.0 mm (0.31 ± 0.04 in) except 2.0 ± 1.0 mm (0.08 ± 0.04 in) from tip
Gearshift spindle A stopper bolt (FM models)	1	8	27 (2.8, 20)	Apply locking agent to the threads. Coating width: 6.5 ± 1.0 mm (0.26 ± 0.04 in) except 6.0 – 8.0 mm (0.24 – 0.31 in) from tip

DUAL CLUTCH TRANSMISSION (FA models)

ITEM		Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Centrifugal clutch lock nut		1	20	118 (12.0, 87)	Lock nut: replace with a new one. Apply engine oil to the threads. Stake.
Oil feed pipe setting cap		1	24	21 (2.1, 15)	
Orifice relief valve socket bolt		1	10	34 (3.5, 25)	Do not remove unless necessary.
Sealing bolt		1	8	16 (1.6, 12)	Do not remove unless necessary.
Gear shift spindle return spring pin	'15 – '19	1	8	22 (2.2, 16)	Apply locking agent to the threads. Coating width: 6.5 ± 1.0 mm (0.26 ± 0.04 in) except 3.0 – 4.0 mm (0.12 – 0.16 in) from tip
	After '19			26 (2.7, 19)	
Shift clutch lock nut		1	18	108 (11.0, 80)	Lock nut: replace with a new one. Apply engine oil to the threads and seating surface. Stake.
Shift drum stopper arm pivot bolt		1	6	12 (1.2, 9)	Apply locking agent to the threads. Coating width: 8.0 ± 1.0 mm (0.31 ± 0.04 in) except 2.0 ± 1.0 mm (0.08 ± 0.04 in) from tip
Shift drum center bolt	'15 – '19	1	8	23 (2.3, 17)	Apply locking agent to the threads. Coating width: 6.5 ± 1.0 mm (0.26 ± 0.04 in) except 3.0 – 4.0 mm (0.12 – 0.16 in) from tip
	After '19			31 (3.2, 23)	
Shift drum guide plate bolt	'15 – '19	2	6	12 (1.2, 9)	Apply locking agent to the threads. Coating width: 6.5 ± 1.0 mm (0.26 ± 0.04 in) except 3.0 – 4.0 mm (0.12 – 0.16 in) from tip
	After '19				Apply locking agent to the threads. Coating width: 6.5 ± 1.0 mm (0.26 ± 0.04 in) except 1.0 – 3.0 mm (0.04 – 0.12 in) from tip
Shift spindle angle sensor socket bolt		2	5	6 (0.6, 4.4)	Apply locking agent to the threads. Coating width: 5.0 ± 1.0 mm (0.2 ± 0.04 in) except 1.0 – 2.0 mm (0.04 – 0.08 in) from tip
Shift drum position switch wire clamp bolt	'15 – '19	2	6	12 (1.2, 9)	Apply locking agent to the threads. Coating width: 6.5 ± 1.0 mm (0.26 ± 0.04 in) except 3.0 – 4.0 mm (0.12 – 0.16 in) from tip
Shift drum position switch retaining bolt	'15 – '19	1	6	12 (1.2, 9)	Apply locking agent to the threads. Coating width: 6.5 ± 1.0 mm (0.26 ± 0.04 in) except 1.0 – 2.0 mm (0.04 – 0.08 in) from tip
TR sensor mounting bolt	After '19	1	6	12 (1.2, 9)	
Neutral switch	After '19	1	10	13 (1.3, 10)	
EOT sensor	'15 – '19	1	10	18 (1.8, 13)	
	After '19			14.5 (1.5, 11)	
Reverse switch	'15 – '19	1	10	13 (1.3, 10)	
Rear VS sensor mounting bolt		1	6	10 (1.0, 7)	

SUB-TRANSMISSION (FA models)

ITEM		Q'TY	THREAD DIA.(mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Rear sub-frame lower mounting nut	'15 – '19	2	12	130 (13.3, 96)	Lock nut: replace with a new one.
Rear sub-frame lower mounting bolt	After '19			120 (12.2, 89)	
Rear sub-frame rear mounting nut	'15 – '19	1	12	130 (13.3, 96)	Lock nut: replace with a new one.
	After '19			75 (7.6, 55)	
Range select lever pivot nut		1	8	21 (2.1, 15)	
Range select arm socket bolt		1	6	12 (1.2, 9)	
Range select gate special bolt		2	6	12 (1.2, 9)	
Setting cap		1	18	18 (1.8, 13)	
Shift arm pinch bolt		1	6	16 (1.6, 12)	

ALTERNATOR/STARTER CLUTCH

ITEM		Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Starter clutch bolt (T40)	'14 – '21	6	8	37 (3.8, 27)	Apply locking agent to the threads. Coating width: 6.5 ± 1.0 mm (0.26 ± 0.04 in) except 3.0 – 4.0 mm (0.12 – 0.16 in) from tip
	After '21			23 (2.3, 17)	
Flywheel bolt (Except CM/ III A types)		1	12	108 (11.0, 80)	Apply engine oil to the threads and seating surface.
Flywheel/driven pulley bolt (CM/ III A types)		1	12	108 (11.0, 80)	Apply engine oil to the threads and seating surface.
CKP sensor bolt		2	5	6 (0.6, 4.4)	Apply locking agent to the threads. Coating width: 6.0 ± 1.0 mm (0.24 ± 0.04 in) except 1.0 – 3.0 mm (0.04 – 0.12 in) from tip
Stator mounting bolt (FM/FE models)		4	6	12 (1.2, 9)	
Stator mounting bolt (FA models)		4	6	10 (1.0, 7)	

CRANKCASE/TRANSMISSION/CRANKSHAFT/BALANCER

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Shift drum bearing set plate (FA models)	2	6	12 (1.2, 9)	Apply locking agent to the threads. Coating width: 5.0 ± 1.0 mm (0.2 ± 0.04 in) except 1.0 – 3.0 mm (0.04 – 0.12 in) from tip

ENGINE REMOVAL/INSTALLATION

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Lower engine hanger nut (left and right)	2	10	63 (6.4, 46)	
Upper engine hanger nut (frame side)	1	10	63 (6.4, 46)	
Upper engine hanger bolt (engine side)	2	8	32 (3.3, 24)	
Gearshift pedal pinch bolt (FM models)	1	6	20 (2.0, 15)	
Shift arm pinch bolt (FA models)	1	6	16 (1.6, 12)	
Front final gear case mounting nut	2	10	44 (4.5, 32)	Lock nut: replace with a new one.

FRONT WHEEL/SUSPENSION/STEERING

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Handlebar switch housing screw (FM models)	2	5	2.7 (0.3, 2.0)	
Rear brake lever bracket holder screw	2	5	4.2 (0.4, 3.1)	
Handlebar switch housing screw (FE/FA models)	3	5	2.7 (0.3, 2.0)	
Front master cylinder holder bolt	2	6	12 (1.2, 9)	
Throttle housing holder screw	2	5	4.2 (0.4, 3.1)	
Throttle lever pivot nut	1	6	7.0 (0.7, 5.2)	
Right handlebar switch screw	3	4	1.5 (0.2, 1.1)	
Front wheel nut (Except FM7/FA7)	8	10	64 (6.5, 47)	
Front wheel nut (FM7/FA7)	8	10	84 (8.6, 62)	
Front brake disc bolt	8	8	42 (4.3, 31)	Replace with a new one.
Upper and lower arm ball joint nut	4	12	29 (3.0, 21)	Castle nut: tighten to the specified torque and further tighten until its grooves align with the cotter pin hole.
Tie-rod joint nut	4	12	54 (5.5, 40)	Lock nut: replace with a new one.
Splash guard bolt	6	6	11 (1.1, 8)	Replace with a new one.
Front wheel hub nut	2	20	137 (14.0, 101)	Castle nut: tighten to the specified torque and further tighten until its grooves align with the cotter pin hole. Apply sealant to the threads. Coating width: 5 mm (0.2 in) minimum
Front brake caliper mounting bolt	4	8	30 (3.1, 22)	Replace with a new one.
Outboard guard mounting bolt	4	6	11 (1.1, 8)	
Brake hose clamp bolt	8	6	12 (1.2, 9)	Replace with a new one.
Steering shaft holder bolt	2	8	32 (3.3, 24)	
Steering bearing holder nut (FM1/FE1/FM5/FA5)	3	10	33.5 (3.4, 25)	See page 18-25
Steering shaft end nut (FM1/FE1/FM5/FA5)	1	14	108 (11.0, 80)	Lock nut: replace with a new one.
EPS unit output shaft end nut (FM2/FE2/FM6/FM7/FA6/FA7)	1	14	108 (11.0, 80)	Lock nut: replace with a new one.
Steering shaft pinch bolt (FM2/FE2/FM6/FM7/FA6/FA7)	1	10	60 (6.1, 44)	Replace with a new one.
EPS unit mounting nut (FM2/FE2/FM6/FM7/FA6/FA7)	3	10	33.5 (3.4, 25)	

REAR WHEEL/SUSPENSION

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Rear wheel nut (Except FM7/FA7)	8	10	64 (6.5, 47)	
Rear wheel nut (FM7/FA7)	8	10	84 (8.6, 62)	
Rear wheel hub nut (FM5/FM6/FM7/ FA5/FA6/FA7)	2	20	137 (14.0, 101)	Castle nut: tighten to the specified torque and further tighten until its grooves align with the cotter pin hole. Apply sealant to the threads. Coating width: 5 mm (0.2 in) minimum
Shock absorber lower mounting bolt (FM1/FM2/FE1/FE2)	1	12	113 (11.5, 83)	Self-lock nut.
Shock absorber upper mounting nut (FM5/FM6/FM7/FA5/FA6/FA7)	2	10	44 (4.5, 32)	Lock nut: replace with a new one.
Shock absorber lower mounting nut (FM5/FM6/FM7/FA5/FA6/FA7)	2	14	88 (9.0, 65)	Lock nut: replace with a new one.
Swingarm pivot nut (FM1/FM2/FE1/ FE2) ('14 – '19)	2	12	130 (13.3, 96)	Self-lock nut.
Swingarm pivot bolt (FM1/FM2// FE2) (After '19)	2	12	120 (12.2, 89)	Self-lock nut.
Trailer hitch nut (FM1/FM2/FE1/ FE2)	2	10	34 (3.5, 25)	Lock nut: replace with a new one.
Universal joint guard bolt (FM1/FM2/ FE1/FE2)	2	6	10 (1.0, 7)	Replace with a new one.
Upper arm pivot nut (frame side) (FM5/FM6/FM7/FA5/FA6/FA7)	2	10	44 (4.5, 32)	Lock nut: replace with a new one.
Lower arm pivot nut (frame side) (FM5/FM6/FM7/FA5/FA6/FA7)	4	10	34 (3.5, 25)	Lock nut: replace with a new one.
Upper and lower arm pivot nut (knuckle side) (FM5/FM6/FM7/FA5/ FA6/FA7)	4	10	44 (4.5, 32)	Lock nut: replace with a new one.
Stabilizer arm holder bolt (FM5/FM6/ FM7/FA5/FA6/FA7)	4	8	26.5 (2.7, 20)	
Stabilizer link nut (Except after '23 FM6/ FA5/FA6/FA7)	4	10	39 (4.0, 29)	Lock nut: replace with a new one.
Stabilizer link flange nut (After '23 FM6/FA5/FA6/FA7)	4	10	54 (5.5, 40)	
Stabilizer link cap nut (After '23 FM6/ FA5/FA6/FA7)	4	10	34 (3.5, 25)	

BRAKE SYSTEM

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Front brake caliper bleed valve	2	8	5.4 (0.6, 4.0)	
Front master cylinder reservoir cap screw	2	4	2.0 (0.2, 1.5)	
Front brake caliper mounting bolt	4	8	30 (3.1, 22)	Replace with a new one.
Front brake pad pin	4	10	17.2 (1.8, 13)	
Front brake pad pin plug	4	10	2.4 (0.2, 1.8)	
Throttle housing holder screw	2	5	4.2 (0.4, 3.1)	
Front master cylinder holder bolt	2	6	12 (1.2, 9)	
Front brake hose oil bolt	3	10	34 (3.5, 25)	
Front brake lever pivot bolt	1	6	1.0 (0.1, 0.7)	
Front brake lever pivot nut	1	6	5.9 (0.6, 4.4)	
Front brake caliper slide pin	2	8	22 (2.2, 16)	Apply locking agent to the threads.
Outboard guard mounting bolt	4	6	11 (1.1, 8)	
Front brake caliper bracket pin	2	8	17.2 (1.8, 13)	
Rear brake arm pinch bolt/nut (FM1/FM2/FE1/FE2)	1	8	20 (2.0, 15)	
Rear brake panel drain bolt (FM1/FM2/FE1/FE2)	1	8	12 (1.2, 9)	
Rear wheel hub nut (FM1/FM2/FE1/FE2)	2	20	137 (14.0, 101)	Castle nut: tighten to the specified torque and further tighten until its grooves align with the cotter pin hole. Apply sealant to the threads. Coating width: 5 mm (0.2 in) minimum
Front brake inhibitor switch screw	1	4	1.2 (0.1, 0.9)	
Brake pipe joint bolt	2	10	14 (1.4, 10)	
Rear brake caliper bleed valve (FM5/FM6/FM7/FA5/FA6/FA7)	1	8	5.4 (0.6, 4.0)	
Rear brake hose oil bolt (FM5/FM6/FM7/FA5/FA6/FA7)	2	10	34 (3.5, 25)	
Rear brake caliper mounting bolt (FM5/FM6/FM7/FA5/FA6/FA7)	2	8	30 (3.1, 22)	Replace with a new one.
Rear brake caliper bracket pin bolt (FM5/FM6/FM7/FA5/FA6/FA7)	1	8	32 (3.3, 24)	
Rear brake caliper slide pin retaining bolt (FM5/FM6/FM7/FA5/FA6/FA7)	1	8	22 (2.2, 16)	
Rear brake caliper parking brake arm nut (FM5/FM6/FM7/FA5/FA6/FA7)	1	10	27 (2.8, 20)	Apply locking agent.
Rear brake master cylinder reservoir hose joint screw (FM5/FM6/FM7/FA5/FA6/FA7)	1	4	1.5 (0.2, 1.1)	Apply locking agent.
Rear brake lever pivot bolt ('14 – '19)	1	6	9.8 (1.0, 7.2)	
Rear brake lever pivot bolt (After '19)	1	6	1.0 (0.1, 0.7)	
Rear brake lever pivot nut ('14 – '19)	1	6	9.8 (1.0, 7.2)	
Rear brake lever pivot nut (After '19)	1	6	5.9 (0.6, 4.4)	

FRONT DRIVING MECHANISM

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Front final gear cover bolt	10	8	26 (2.7, 19)	
Front final gear pinion bearing lock nut	1	60	80 (8.2, 59)	Lock nut: replace with a new one. Stake.
Differential ring gear bolt	11	8	49 (5.0, 36)	Replace with a new one.
Difflock actuator mounting bolt	3	6	12 (1.2, 9)	
Front final gear case mounting nut	2	10	44 (4.5, 32)	Lock nut: replace with a new one.

REAR DRIVING MECHANISM

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Rear brake panel stud bolt (FM1/FM2/FE1/FE2)	2	10	–	See page 22-10
Rear final gear case cover bolt	2	10	46.5 (4.7, 34)	Apply locking agent to the threads.
	6	8	25 (2.5, 18)	
Rear final gear pinion bearing lock nut (FM1/FM2/FE1/FE2)	1	64	98 (10.0, 72)	Lock nut: replace with a new one. Stake.
Rear final gear pinion bearing lock nut (FM5/FM6/FM7/FA5/FA6/FA7)	1	72	98 (10.0, 72)	Lock nut: replace with a new one. Stake.
Rear final gear case mounting bolt (FM1/FM2/FE1/FE2)	8	10	74 (7.5, 55)	
Rear final gear case mounting nut (FM5/FM6/FM7/FA5/FA6/FA7)	2	10	44 (4.5, 32)	Lock nut: replace with a new one.
Rear final gear pinion joint lock nut (FM5/FM6/FM7/FA5/FA6/FA7)	1	16	108 (11.0, 80)	Apply locking agent to the threads.
Rear brake panel mounting nut (FM1/FM2/FE1/FE2)	4	10	46.5 (4.7, 34)	Lock nut: replace with a new one.
Rear wheel hub nut (FM1/FM2/FE1/FE2)	2	20	137 (14.0, 101)	Castle nut: tighten to the specified torque and further tighten until its grooves align with the cotter pin hole. Apply sealant to the threads. Coating width: 5 mm (0.2 in) minimum
Rear brake disc bolt (FM5/FM6/FM7/FA5/FA6/FA7)	5	6	20 (2.0, 15)	Replace with a new one.

LIGHTS/METERS/SWITCHES

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Combination meter mounting screw	3	5	0.8 (0.1, 0.6)	
Front brake inhibitor switch screw	1	4	1.2 (0.1, 0.9)	
Rear brake light switch screw	1	4	1.2 (0.1, 0.9)	
Gear position switch wire clamp bolt (FM models /'14 – '19 FE models)	2	6	12 (1.2, 9)	Apply locking agent to the threads. Coating width: 6.5 ± 1.0 mm (0.26 ± 0.04 in) except 1.0 – 2.0 mm (0.04 – 0.08 in) from tip
Gear position switch retaining bolt (FM models /'14 – '19 FE models)	1	6	12 (1.2, 9)	Apply locking agent to the threads. Coating width: 6.5 ± 1.0 mm (0.26 ± 0.04 in) except 1.0 – 2.0 mm (0.04 – 0.08 in) from tip

ELECTRIC SHIFT PROGRAM (ESP: FE models)

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Shift spindle angle sensor mounting bolt	2	5	5 (0.5, 3.6)	Apply locking agent to the threads. Coating width: 5.0 ± 1.0 mm (0.2 ± 0.04 in) except 1.0 – 2.0 mm (0.04 – 0.08 in) from tip
TR sensor mounting bolt (After '19)	1	6	12 (1.2, 9)	
Neutral switch (After '19)	1	10	13 (1.3, 10)	

OTHERS

ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
Parking brake lever pivot screw	1	6	6.9 (0.7, 5.1)	
Front reflex reflector (After '19)	2	6	1.5 (0.2, 1.1)	Lock nut: replace with a new one.
Rear reflex reflector (After '19)	4	6	1.5 (0.2, 1.1)	Lock nut: replace with a new one.

LUBRICATION & SEAL POINTS

ENGINE

MATERIAL	LOCATION	REMARKS
Molybdenum oil solution (a mixture of 1/2 engine oil and 1/2 molybdenum disulfide grease)	Camshaft cam lobes	
	Rocker arm shaft sliding surface	
	Valve stem (valve guide sliding surface)	
	Change clutch outer guide inner and outer surfaces	FM/FE models
	Crankshaft starter driven gear sliding surfaces	
	Piston pin outer surface	
	Starter reduction gear shaft whole surface	
	Water pump shaft journal and thrust washer	
	Mainshaft gear and bushing sliding surfaces	
	Countershaft gear and bushing sliding surfaces	
	Starter motor shaft splines	
	Starter motor shaft end	
Engine oil	Inside of oil filter cover	FM/FE models (All)/FA models (After '19)
	Rocker arm followers and adjusting screw tips	
	Cam chain whole surfaces	
	Cam follower whole surfaces	
	Connecting rod small end inner surface	
	Piston outer surface and piston pin hole	
	Piston ring whole surfaces	
	Cylinder bore	
	Clutch adjusting plate boss outer surface	FM/FE models
	Change clutch disc whole surfaces	
	Centrifugal clutch drum sprag clutch contacting surface	
	Centrifugal clutch drive plate sprag clutch contacting surface	
	Centrifugal sprag clutch whole surface	
	Crankshaft and primary drive gear rolling surface	FA models
	Starter reduction gear teeth	
	Reverse stopper shaft journal surface	'14 – '19 models
	Starter sprag clutch whole surface	
	Mainshaft and countershaft journal surfaces	
	Shift valve outer surface	FA models
	Mainshaft and dual clutch rolling surface	FA models
	Drum shifter, spring, plunger and ratchet pawl whole surface	FA models
	Gearshift spindle journal surface	FA models
	Shift fork shaft whole surface	
	Shift drum grooves	
	Collar and bushing journal surfaces	FM/FE models
	Sub-transmission shift fork sliding portion	FA models
	Sub-transmission change spindle sliding portion	FA models
	Each bearing rotating area	
	Each O-ring whole surface	Except water pomp cover O-ring
	Each oil seal lip	Except mechanical seal
Mobilith SHC 100 (EXXON)	Recoil starter driven pulley oil seal lips	Canada type

MATERIAL	LOCATION		REMARKS
Locking agent	Cam chain tensioner lifter bolt threads	'14 – '19	FM/FE models Coating width: 6.5 ± 1.0 mm (0.26 ± 0.04 in) except 3.0 – 4.0 mm (0.12 – 0.16 in) from tip
		'15 – '19	FA models Coating width: 6.5 ± 1.0 mm (0.26 ± 0.04 in) except 1.0 – 2.0 mm (0.04 – 0.08 in) from tip
		After '19	All models Coating width: 6.5 ± 1.0 mm (0.26 ± 0.04 in) except 1.0 – 3.0 mm (0.04 – 0.12 in) from tip
	Camshaft bearing setting plate bolt threads	'14 – '19	Apply locking agent to the threads. Coating width: 5.0 - 8.0 mm (0.20 - 0.31 in) except 2.0 - 5.0 mm (0.08 - 0.20 in) from tip
		After '19	Apply locking agent to the threads. Coating width: 6.5 ± 1.0 mm (0.26 - 0.31 in) except 2.0 - 4.0 mm (0.08 - 0.16 in) from tip
	Recoil starter assembly mounting bolt threads	'14 – '19	Canada type Coating width: 6.5 ± 1.0 mm (0.26 ± 0.04 in) except 3.0 – 4.0 mm (0.12 – 0.16 in) from tip
		After '19	Canada type Coating width: 6.5 ± 1.0 mm (0.26 ± 0.04 in) except 1.0 – 2.0 mm (0.04 – 0.08 in) from tip
	Mainshaft bearing setting plate bolt threads		FM/FE models Coating width: 6.5 ± 1.0 mm (0.26 ± 0.04 in) except 1.0 – 2.0 mm (0.04 – 0.08 in) from tip
Liquid sealant (ThreeBond 1215 or equivalent)	Front crankcase cover mating surface		FM/FE models: See page 12-7 FA models: See page 13-49
	Alternator/CKP sensor wire grommet seating surface		
	Gear position switch wire grommet seating surface		FM models /'14-'19 FE models
	Rear crankcase cover mating surface		FM/FE models: See page 15-14 FA models: See page 15-16
	Crankcase mating surface		See page 16-20
	Reduction gear cover mating surface		FE models: See page 25-35 FA models: See page 13-61
UNIREX N3 grease (EXXON)	Electric shift reduction gear/spindle gear teeth and journals (front crankcase cover and gear cover)		FE models: See page 25-35 FA models: See page 13-60 2.0 – 4.0 g (0.07 – 0.14 oz)
Lithium grease	Sub-transmission change lever and pin sliding portion		FA models
	Sub-transmission change stopper pin sliding portion		FA models
SHIN-ETSU KE45	Stator/CKP sensor grommet groove edges		

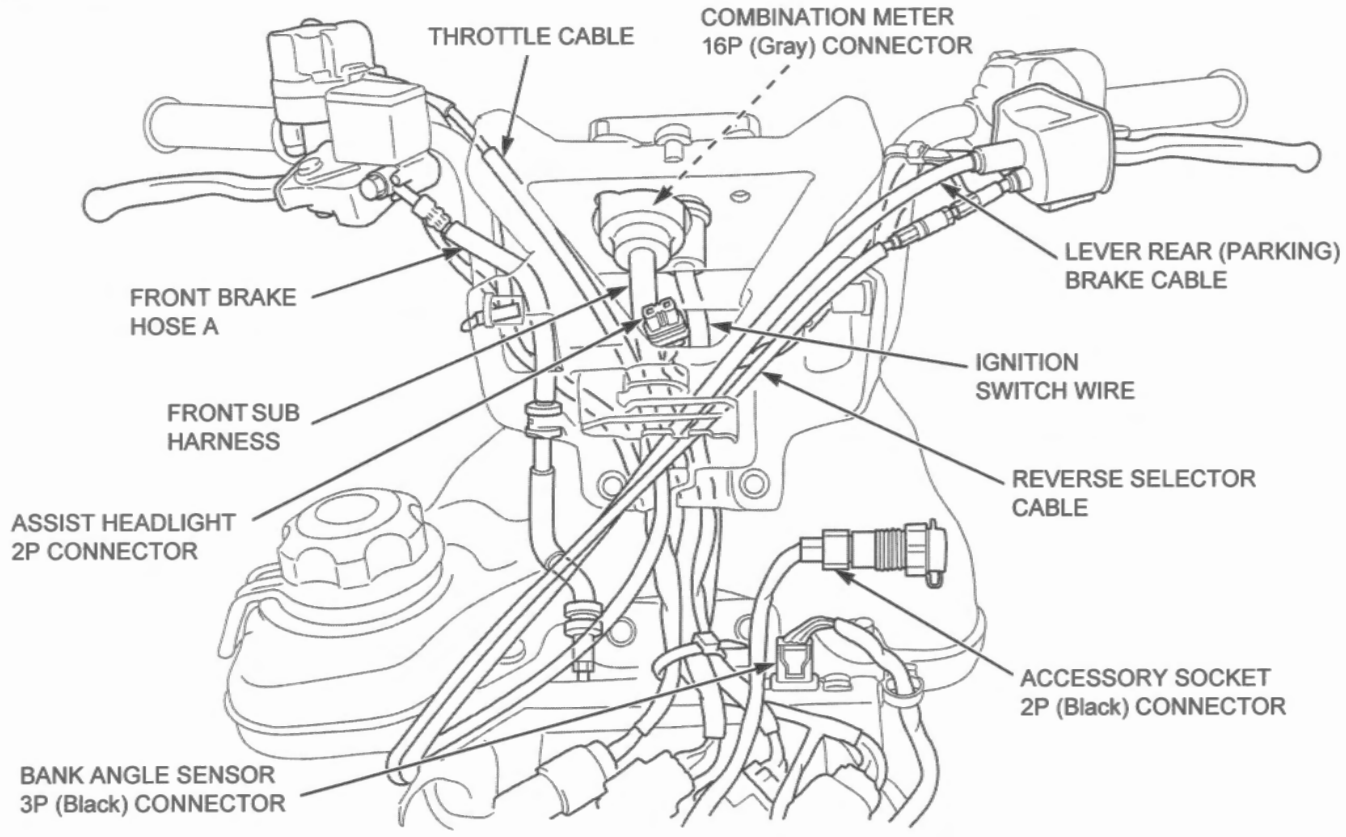
FRAME

MATERIAL	LOCATION	REMARKS
Multi-purpose grease	Throttle cable end (lever side)	
	Throttle cable outer threads (each end)	
	Throttle lever pivot and dust seal lip	FM1/FM2/FE1/FE2
	Rear (parking) brake lever pivot	
	Parking arm pin	
	Steering shaft bushing sliding surface	2.0 – 3.0 g (0.07 – 0.11 oz)
	Stabilizer arm and bushing contacting surfaces	FM5/FM6/FM7/FA5/FA6/FA7
	Rear brake cam dust seal lips	FM1/FM2/FE1/FE2
	Rear brake cam spindle	FM1/FM2/FE1/FE2 0.2 – 0.3 g (0.007 – 0.011 oz)
	Rear brake cam shoe contacting surfaces	FM1/FM2/FE1/FE2 0.2 – 0.3 g (0.007 – 0.011 oz)
	Rear brake panel anchor pin shoe contacting surfaces	FM1/FM2/FE1/FE2 0.2 – 0.3 g (0.007 – 0.011 oz)
	Rear brake drum cover dust seal lips	FM1/FM2/FE1/FE2 3.0 – 4.0 g (0.11 – 0.14 oz)
	Rear brake panel O-ring (drum cover and swingarm side)	FM1/FM2/FE1/FE2
	Rear brake panel bearing	FM1/FM2/FE1/FE2 4.0 – 5.0 g (0.14 – 0.18 oz)
	Rear brake panel dust seal lips	FM1/FM2/FE1/FE2
	Rear brake pedal pivot sliding area	FM1/FM2/FE1/FE2
	Rear brake pedal pivot dust seal lips	
	Rear brake cable ends (lever and pedal side)	FM1/FM2/FE1/FE2
	Rear brake cable ends (lever side)	FM5/FM6/FM7/FA5/FA6/FA7
	Front final gear case oil seal lips (for drive shafts)	
	Front final gear case oil seal lips (for front final clutch joint)	
	Difflock actuator oil seal lips	
	Front final gear oil filler cap O-ring	
	Difflock actuator O-ring	
	Rear final gear pinion joint O-ring	FM5/FM6/FM7/FA5/FA6/FA7
	Rear final gear case oil seal lips (for propeller shaft)	
	Rear final gear case oil seal lips (for ring gear)	
	Rear final gear case O-ring	
	Rear final gear oil filler cap O-ring	
	Left axle housing O-ring	FM1/FM2/FE1/FE2
	Left axle housing dust seal lips	FM1/FM2/FE1/FE2
	Sub-transmission range select lever pivot	FA models
	Sub-transmission range select lever arm pivot	FA models
Molybdenum disulfide grease	Rear knuckle pivot bushing	FM5/FM6/FM7/FA5/FA6/FA7
	Rear knuckle pivot seal lips	FM5/FM6/FM7/FA5/FA6/FA7
	Rear shock absorber lower pivot dust seal lip and bushing	FM5/FM6/FM7/FA5/FA6/FA7
	Front drive shaft splines (wheel side)	
	Rear drive shaft splines (wheel/final gear side)	FM5/FM6/FM7/FA5/FA6/FA7
	Steering shaft bearing	FM1/FE1/FM5/FA5 2.0 – 3.0 g (0.07 – 0.11 oz)
	Steering shaft spline	FM1/FE1/FM5/FA5
	Steering shaft dust seal lips	FM1/FE1/FM5/FA5
	EPS unit output shaft spline	FM2/FE2/FM6/FM7/FA6/FA7
	Front propeller shaft boot lip	
	Front propeller shaft seal lips	
	Front propeller shaft splines (both sides)	5.0 – 5.3 g (0.18 – 0.19 oz)
	Front propeller shaft joint splines	5.0 – 5.3 g (0.18 – 0.19 oz)
	Front propeller shaft end (final clutch joint contacting area)	
	Universal joint splines (both sides)	
	Rear propeller shaft splines (gear case side)	FM1/FM2/FE1/FE2
	Rear propeller shaft boot contacting area	FM5/FM6/FM7/FA5/FA6/FA7
	Rear propeller shaft pinion joint spline	FM5/FM6/FM7/FA5/FA6/FA7 5.0 – 8.0 g (0.18 – 0.28 oz)
	Output shaft O-ring	
	Rear propeller shaft O-ring	
	Rear axle splines (3 places)	FM1/FM2/FE1/FE2

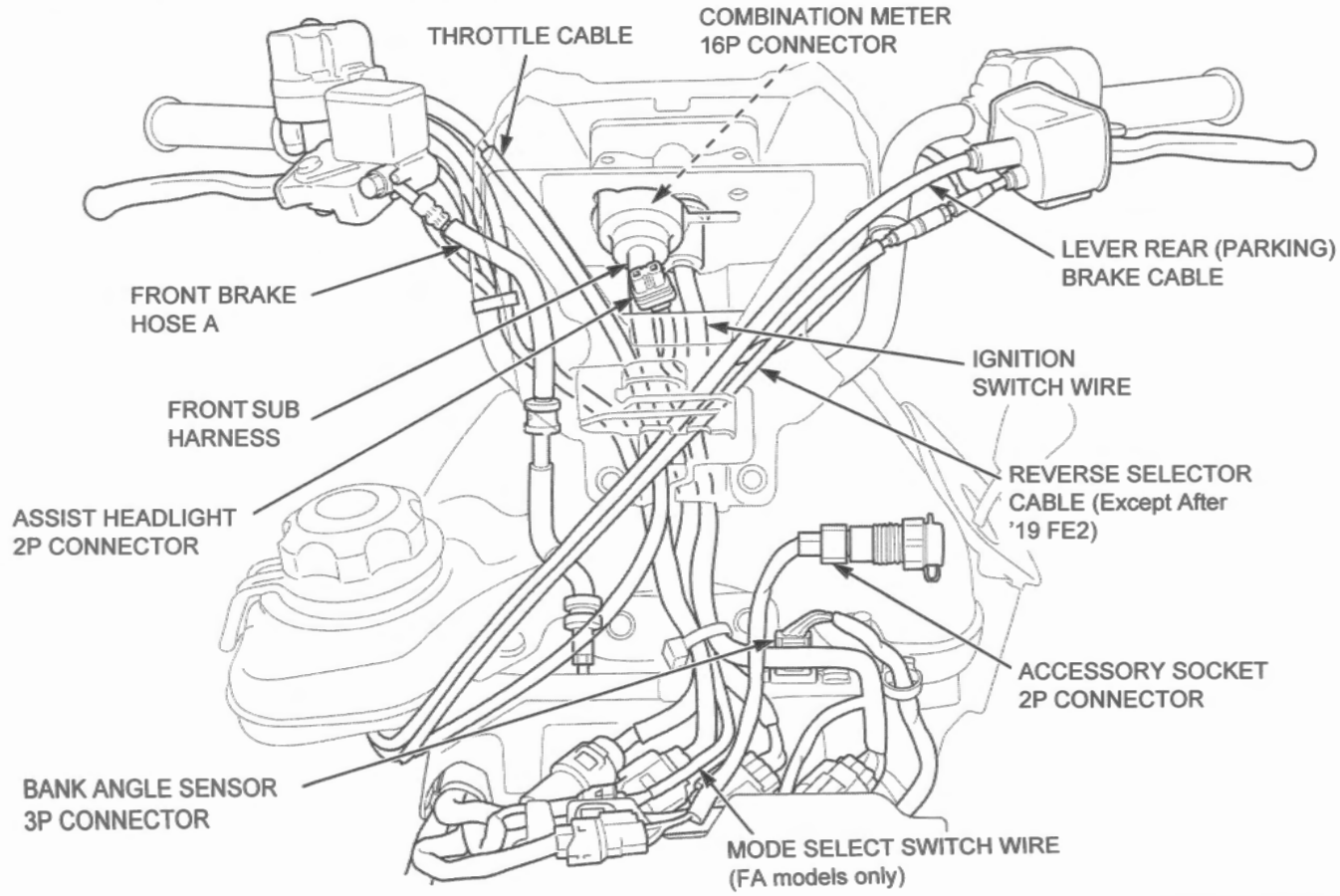
MATERIAL	LOCATION	REMARKS
NKG814 (Kyodo Yushi)	Front drive shaft outboard joint inside	'14 – '19 FM and FE models/'15 – '16 FA models 35 – 55 g (1.2 – 1.9 oz)
	Front drive shaft inboard joint inside	'14 – '19 FM and FE models/'15 – '16 FA models 50 – 70 g (1.8 – 2.5 oz)
G.A. Besmoly CE (Brugarolas)	Front drive shaft outboard joint inside	After '16 FA models/After '19 FM and FE models 50 – 70 g (1.8 – 2.5 oz)
	Front drive shaft inboard joint inside	After '16 FA models/After '19 FM and FE models 65 – 85 g (2.3 – 3.0 oz)
NKG509 (Kyodo Yushi)	Rear drive shaft outboard joint inside	FM5/FM6/FM7/FA5/FA6/FA7 40 – 60 g (1.4 – 2.1 oz)
	Rear drive shaft inboard joint inside	FM5/FM6/FM7/FA5/FA6/FA7 60 – 80 g (2.1 – 2.8 oz)
Oilstomoly 2 LN 584 LO (Castrol)	Rear drive shaft outboard/inboard joint inside	After '19 70 – 90 g (2.5 – 3.2 oz)
Honda Bond A or Pro Honda Handgrip Cement (U.S.A. only) or equivalent	Handlebar grip rubber inside	
	Air cleaner housing-to-connecting tube mating area	
	Air cleaner housing-to-intake air duct tube mating area	
	Air cleaner housing-to-air cleaner sub chamber tube mating area	
	Air cleaner housing-to-IAT sensor grommet mating area	
Engine oil	Rear brake cam felt seal	FM1/FM2/FE1/FE2
Silicone grease	Front brake lever-to-master piston contacting area	0.10 g (0.004 oz)
	Front brake lever pivot	0.10 g (0.004 oz)
	Front brake caliper piston sealing area	0.20 g (0.007 oz) minimum
	Front brake caliper piston boot inside	0.50 - 0.70 g (0.018 - 0.025 oz)
	Front brake caliper slide pin groove and sliding area	0.40 g (0.014 oz) minimum
	Front brake caliper bracket pin boot inside	0.40 g (0.014 oz) minimum
	Rear brake caliper piston boot	FM5/FM6/FM7/FA5/FA6/FA7 Seal area: Apply 0.2 g Inside: Fill up 0.5 – 0.7 g
	Rear brake caliper slide pin/bracket pin collar inner surface	FM5/FM6/FM7/FA5/FA6/FA7 0.4 g minimum
	Rear brake caliper parking brake cam groove	FM5/FM6/FM7/FA5/FA6/FA7 Apply 0.35 g minimum
	Rear brake caliper parking brake dust cover lips	FM5/FM6/FM7/FA5/FA6/FA7 Apply 0.35 g minimum
	Rear brake caliper parking brake sleeve piston	FM5/FM6/FM7/FA5/FA6/FA7 Apply 0.8 g minimum
	Rear brake caliper parking brake rod ends	FM5/FM6/FM7/FA5/FA6/FA7 Apply 0.35 g minimum
	Rear brake caliper cup	FM5/FM6/FM7/FA5/FA6/FA7 Apply 0.1 g minimum
	Rear brake master cylinder push rod-to master piston contacting area	FM5/FM6/FM7/FA5/FA6/FA7 Apply 0.1 g
	Rear brake master cylinder push rod boot	FM5/FM6/FM7/FA5/FA6/FA7
DOT 4 brake fluid	Brake master cylinder piston and cups	
	Brake caliper piston and piston seal	
Cable lubricant	Rear brake inner cables	
Liquid sealant (ThreeBond 1215 or equivalent)	Rear final gear case cover mating surface	
	Front final gear case cover mating surface	
Locking agent	Rear final gear case cover 10 mm bolt threads	Coating width: 4 mm (0.2 in) minimum
Pro Honda Foam Filter Oil or equivalent	Air cleaner element inside	17 – 23 g (0.6 – 0.8 oz)

CABLE & HARNESS ROUTING

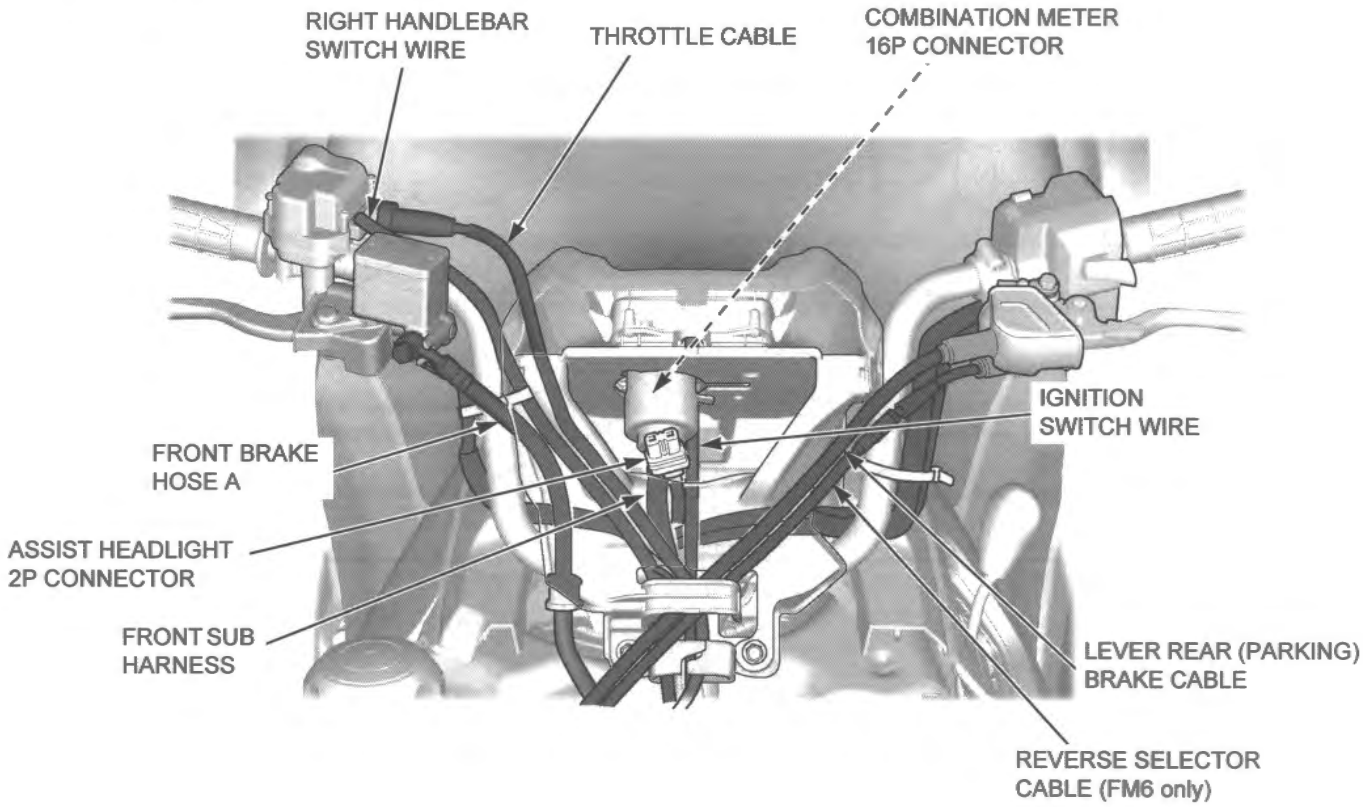
FM1/FM2/FE1/FE2 ('14):



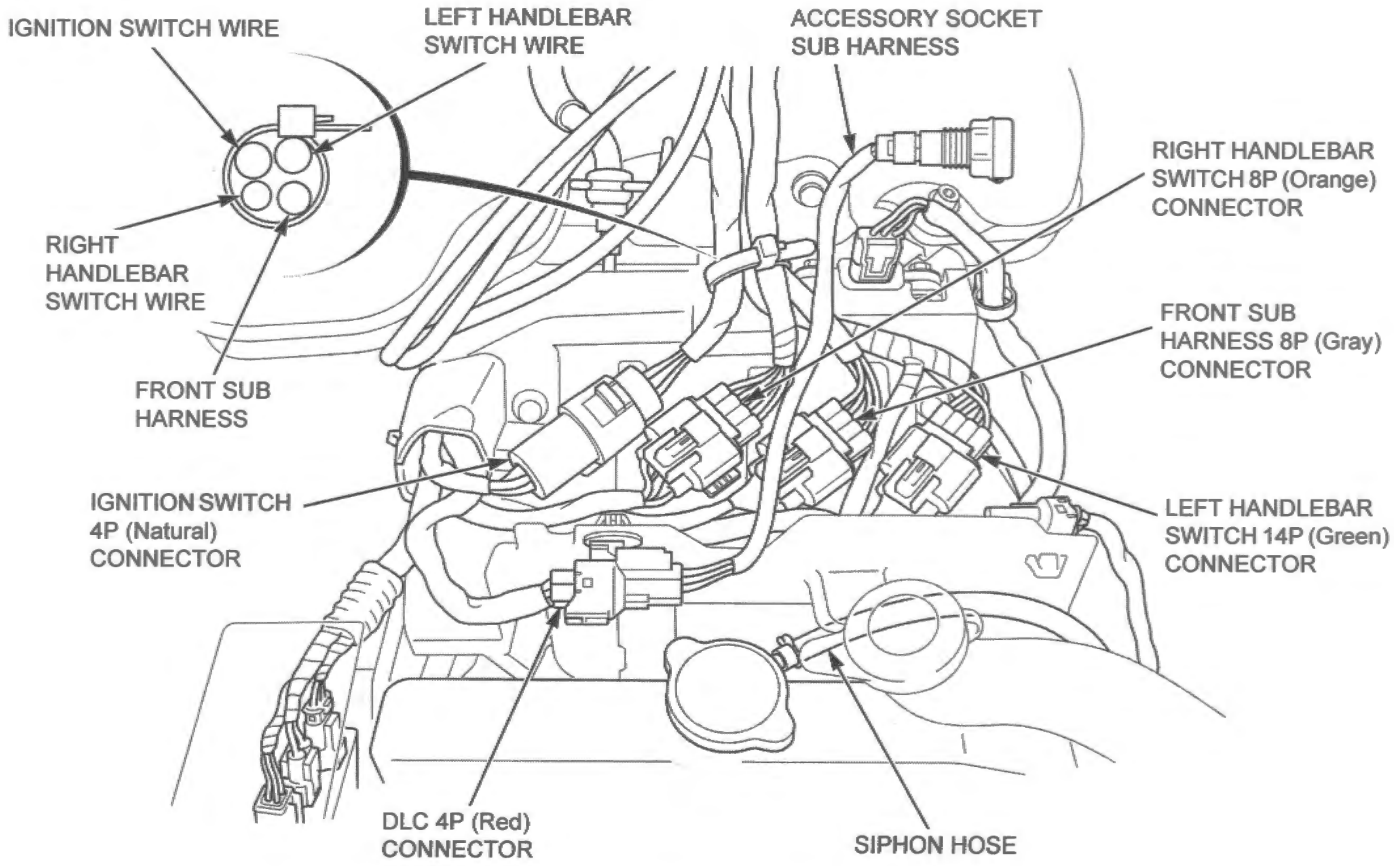
FM5/FM6/FM7/FA5/FA6/FA7 ('15 – '19) and FM1/FM2/FE1/FE2 (After '14):



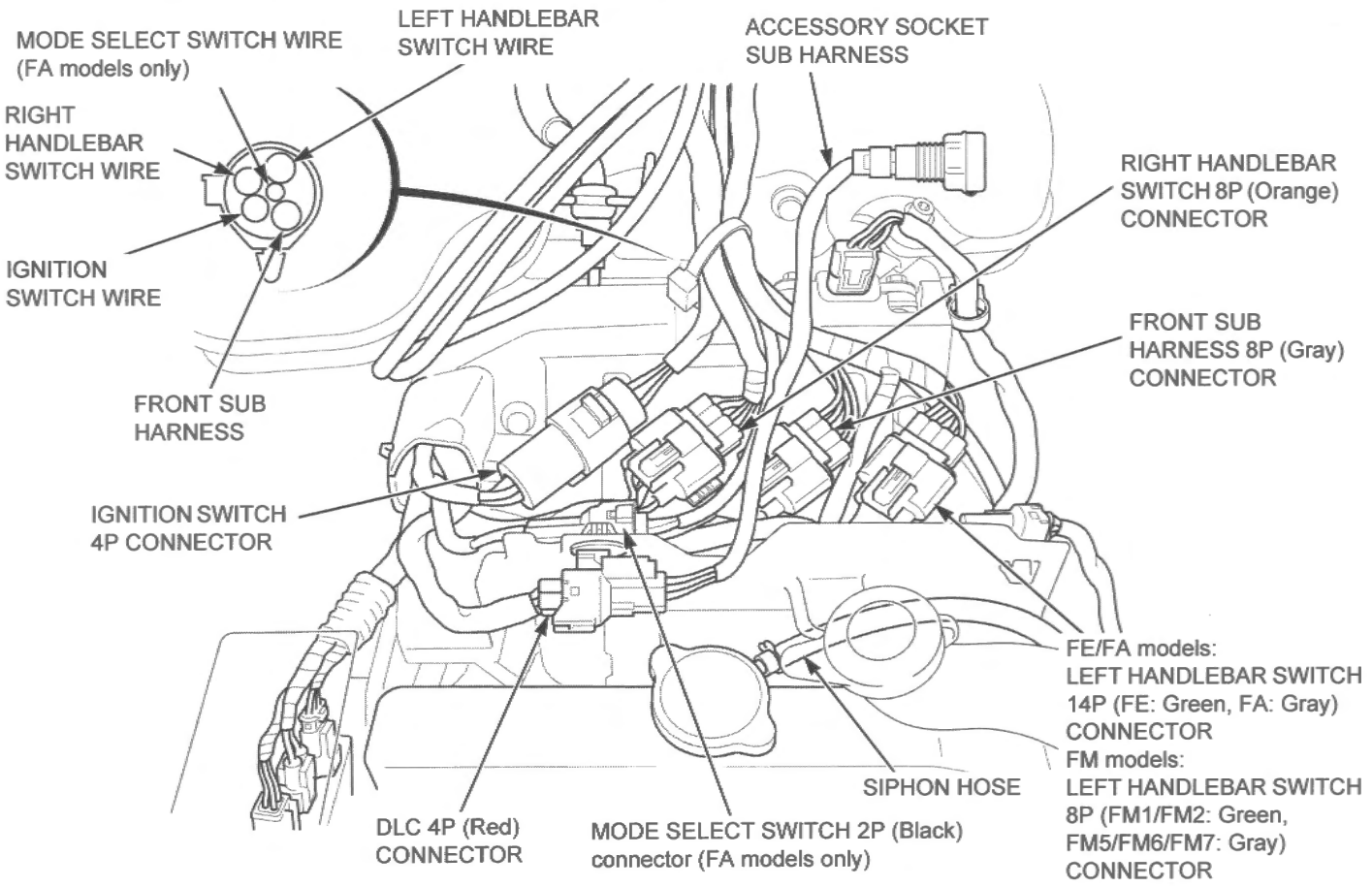
FM6/FA5/FA6/FA7 (After '19):



FM1/FM2/FE1/FE2 ('14):

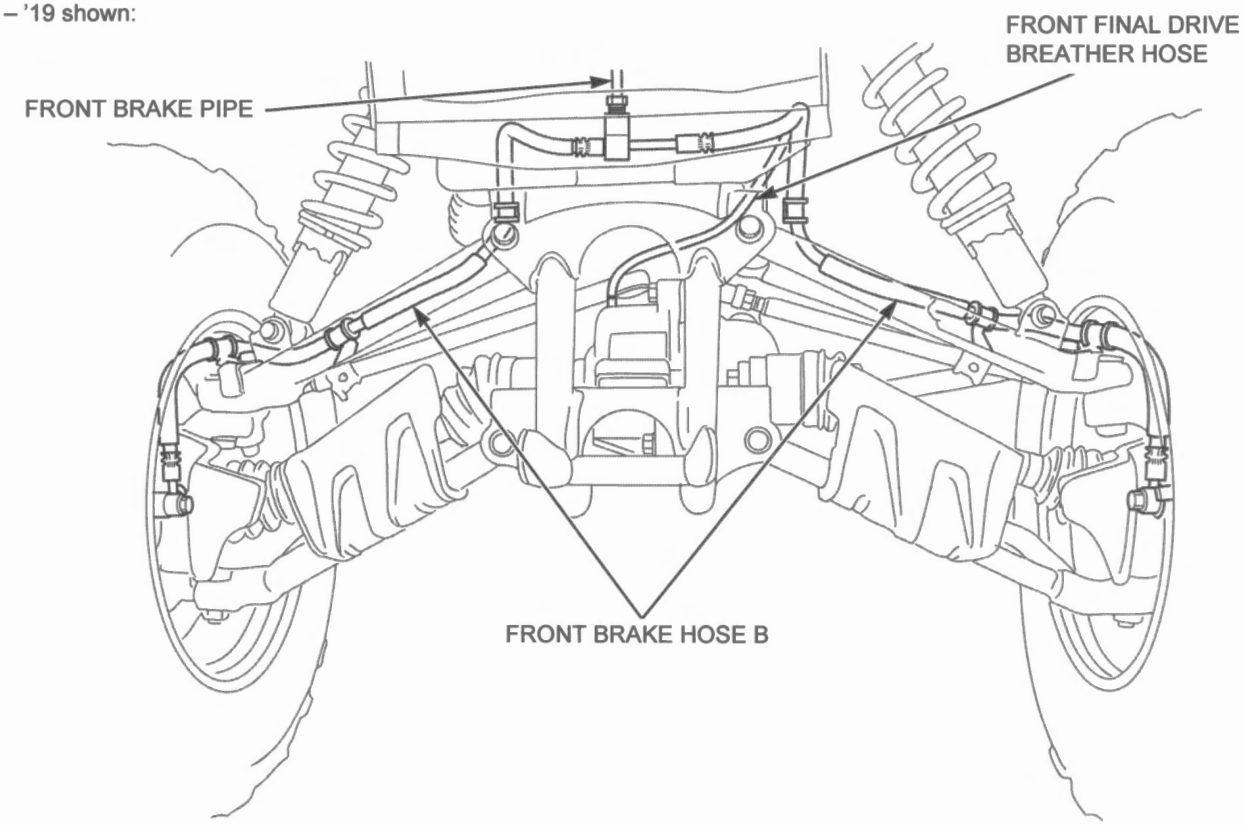


FM5/FM6/FM7/FA5/FA6/FA7 and FM1/FM2/FE1/FE2 (After '14):



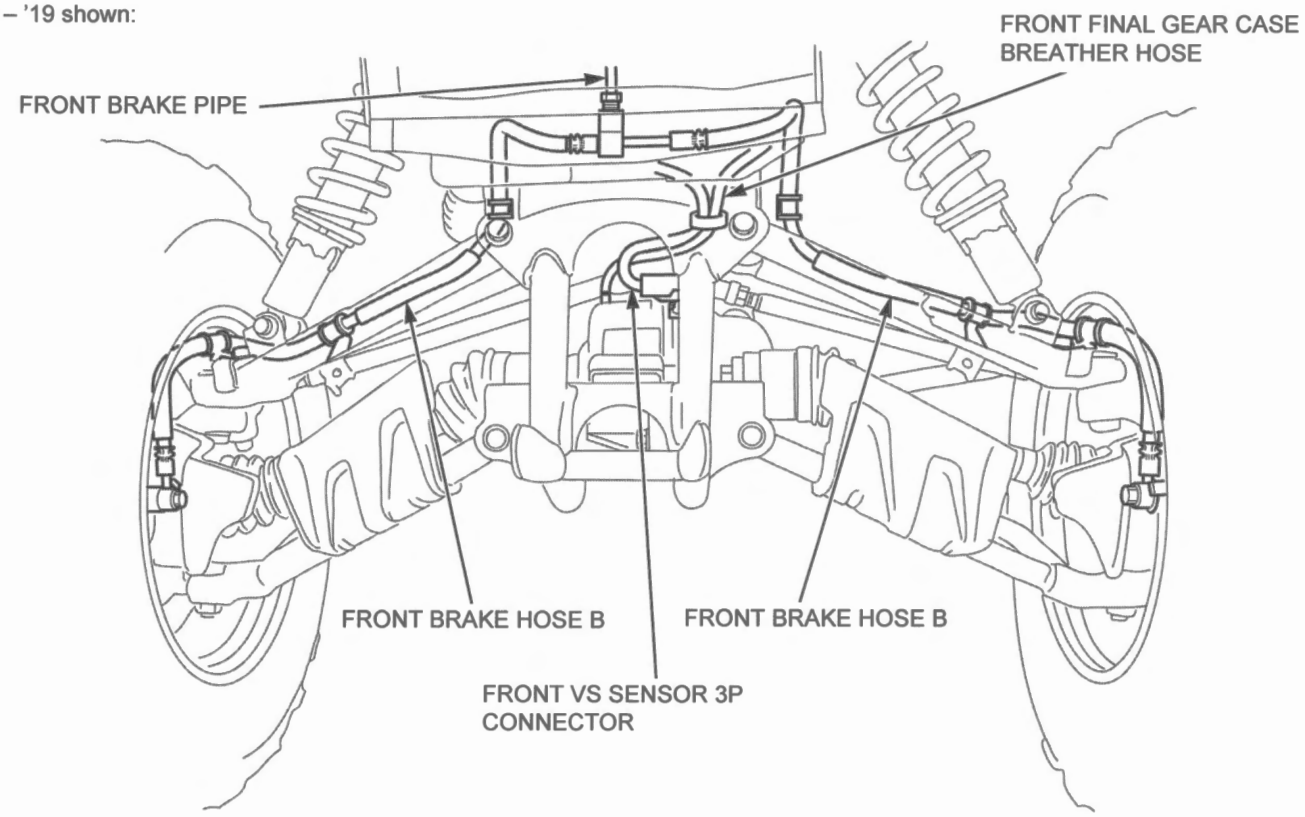
FM/FE models:

'14 – '19 shown:

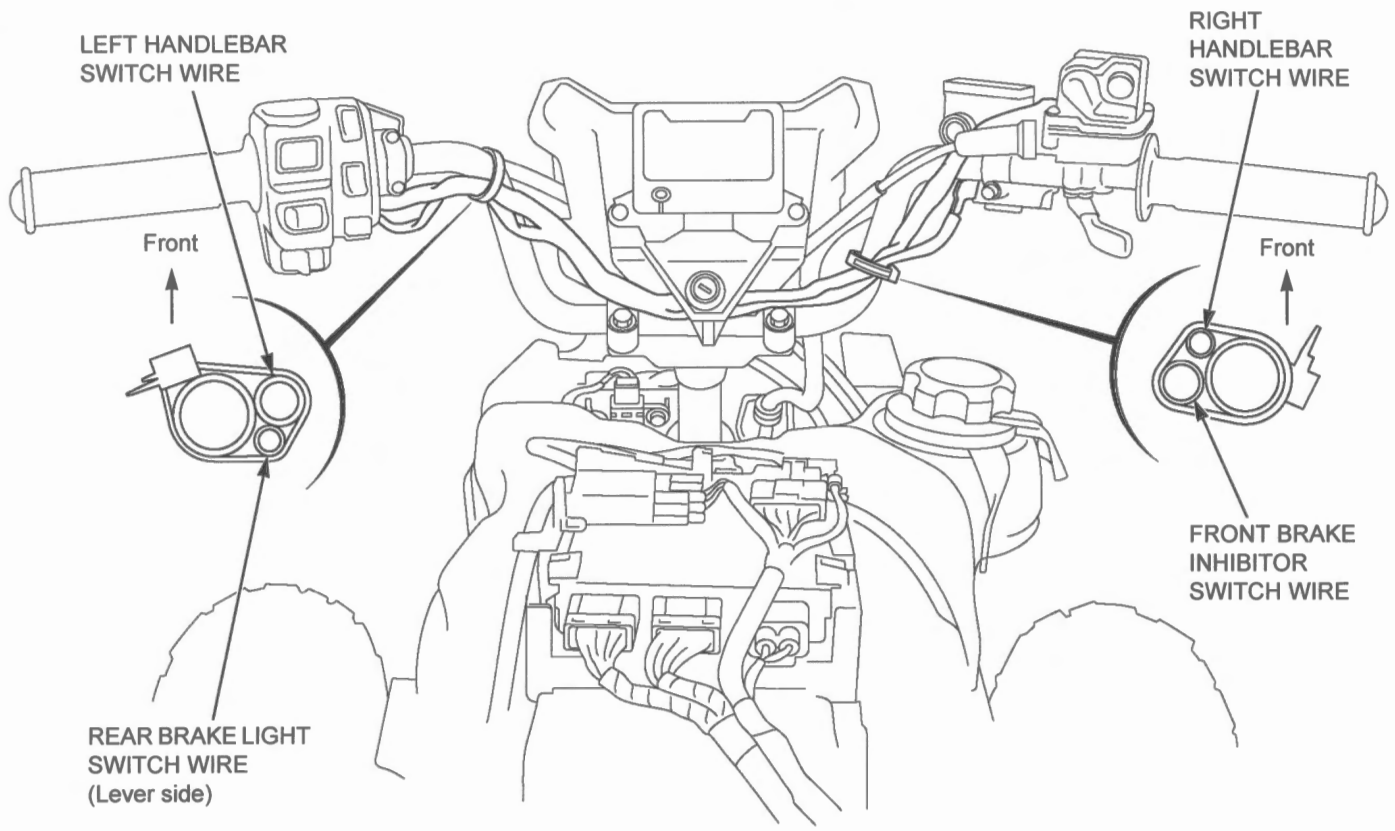


FA models:

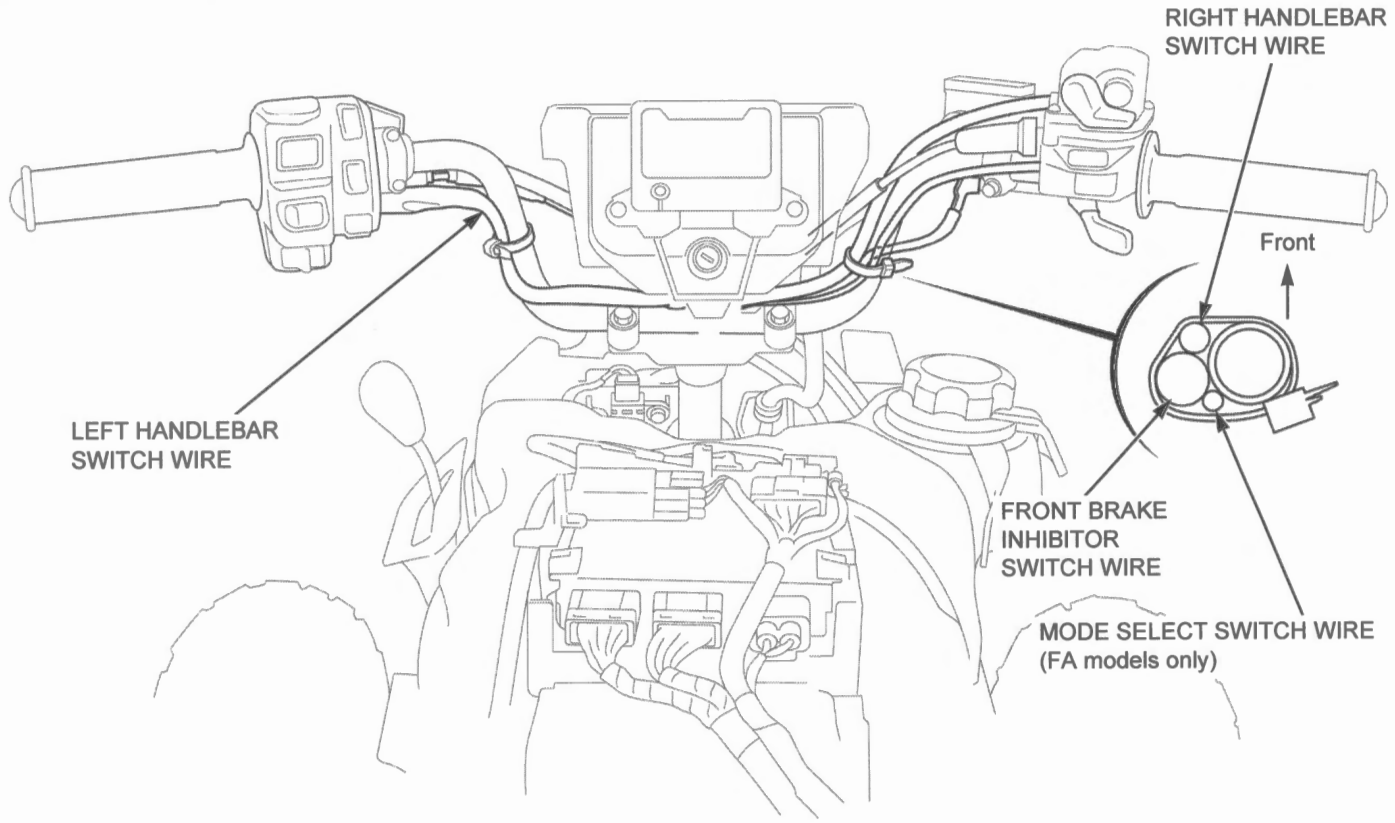
'15 – '19 shown:



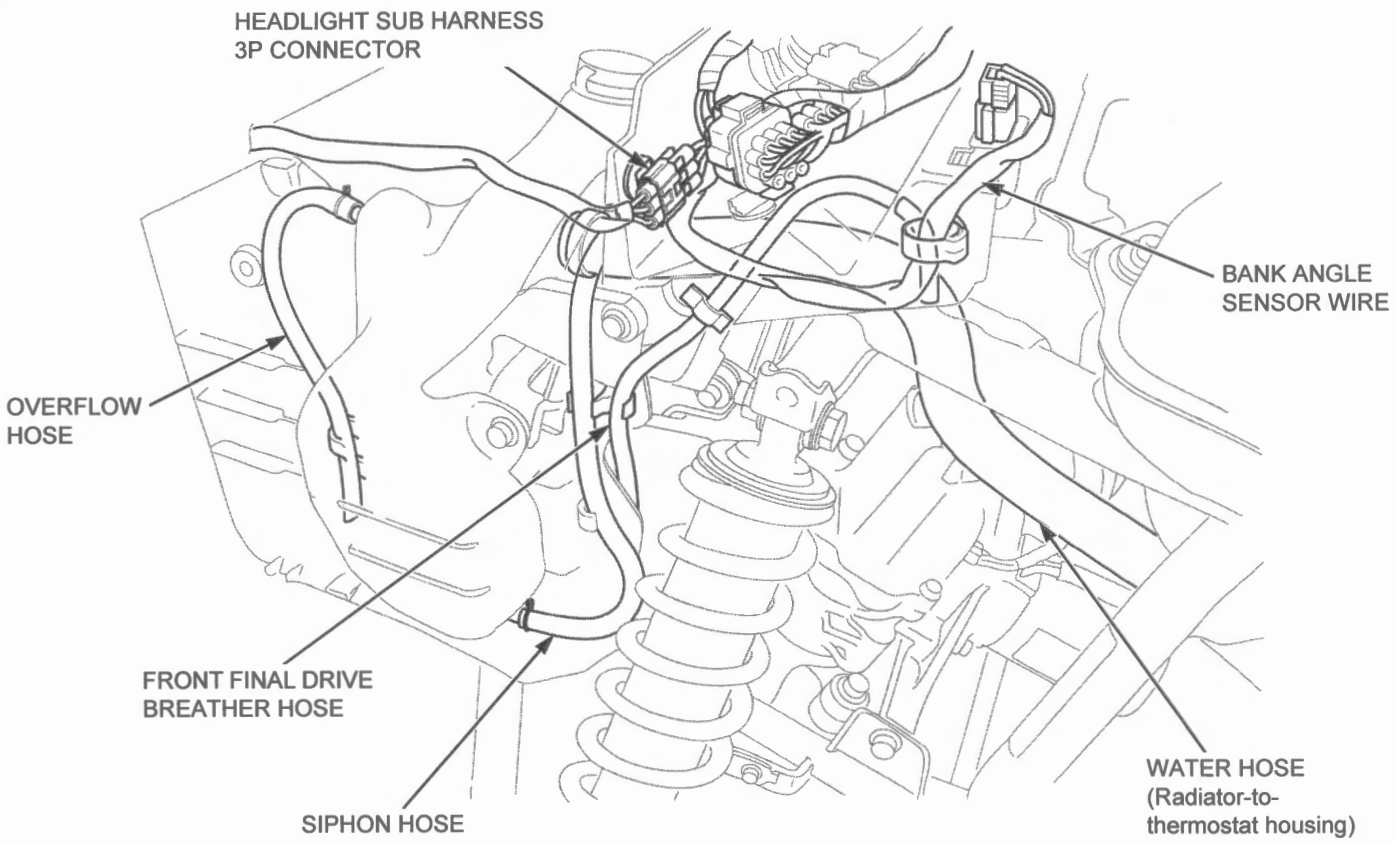
FM1/FM2/FE1/FE2:



FM5/FM6/FM7/FA5/FA6/FA7:

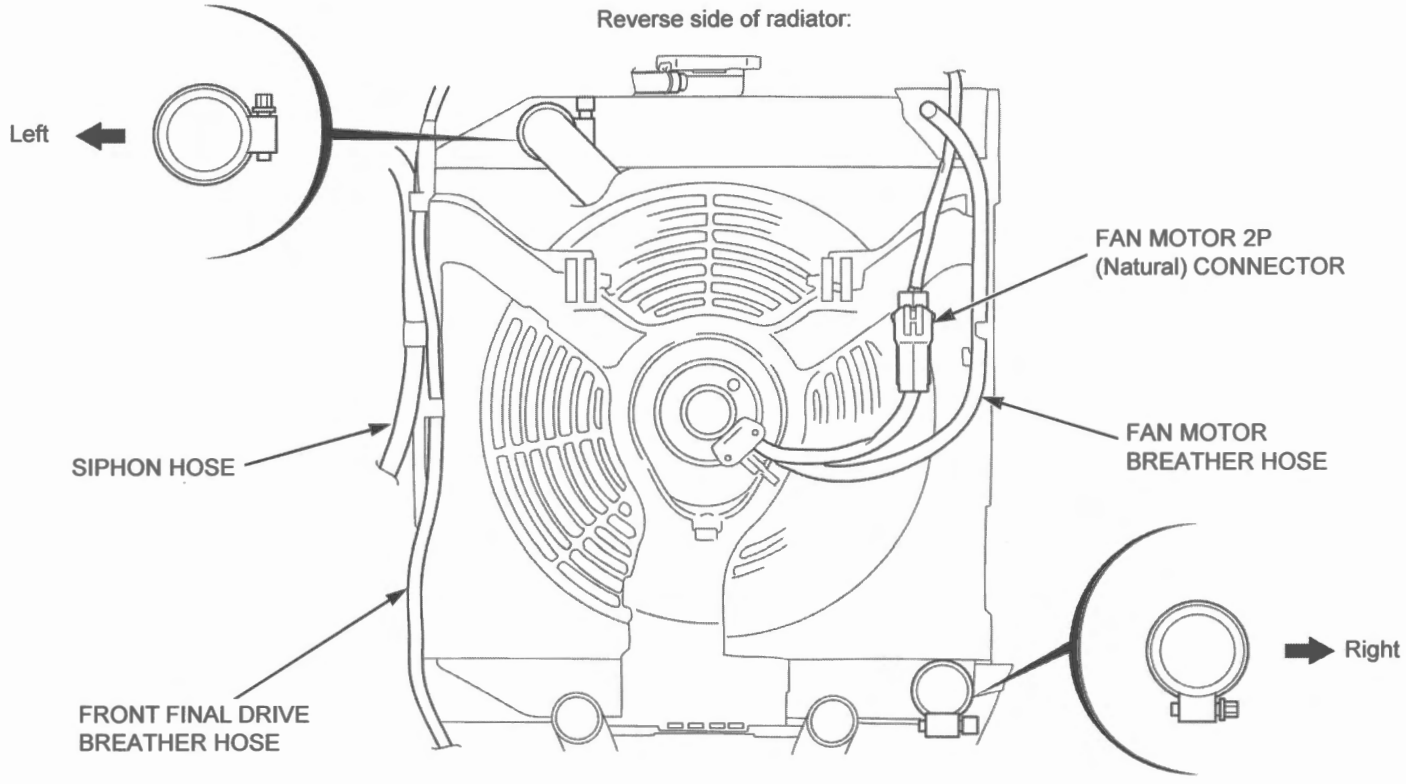


All models:

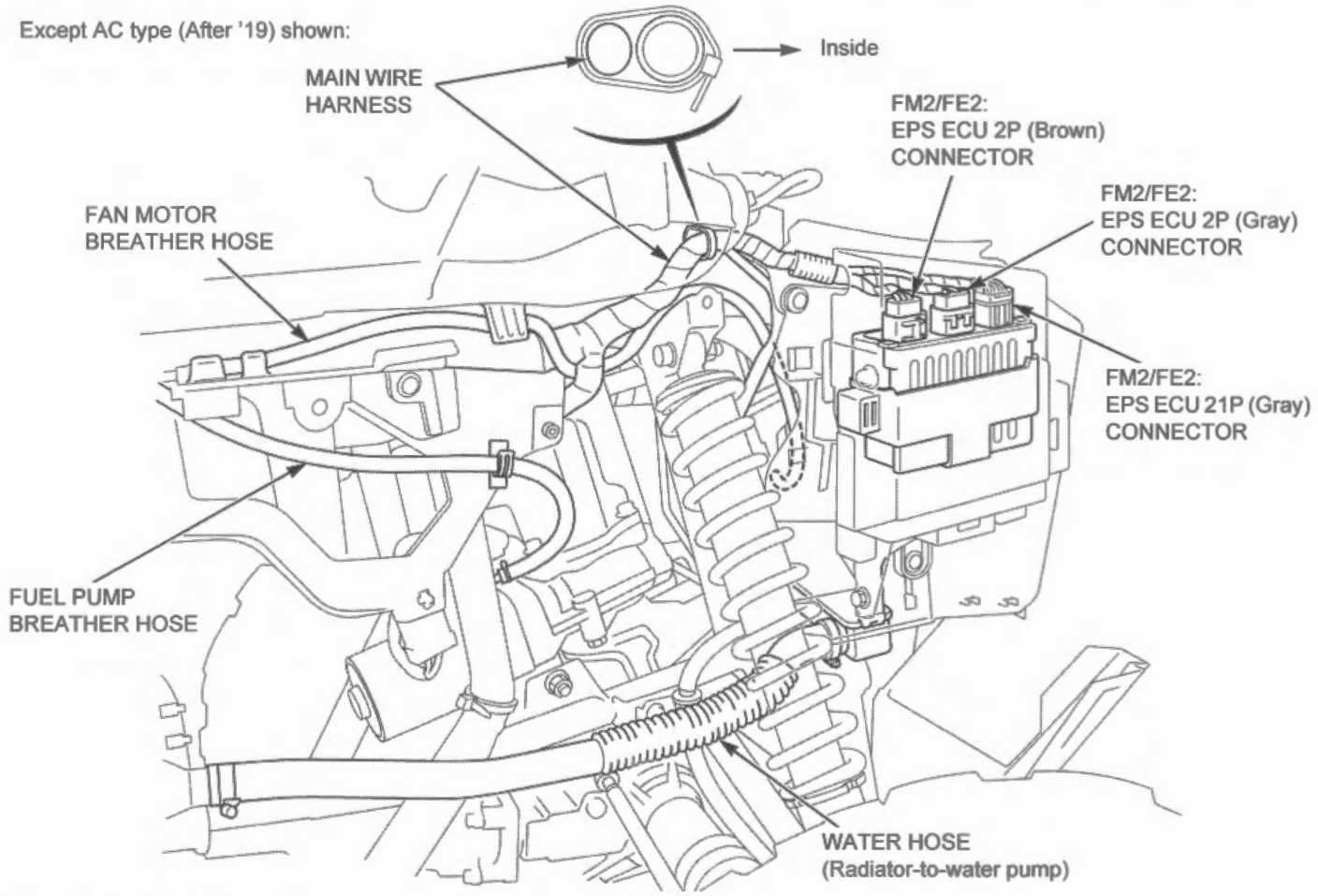


All models:

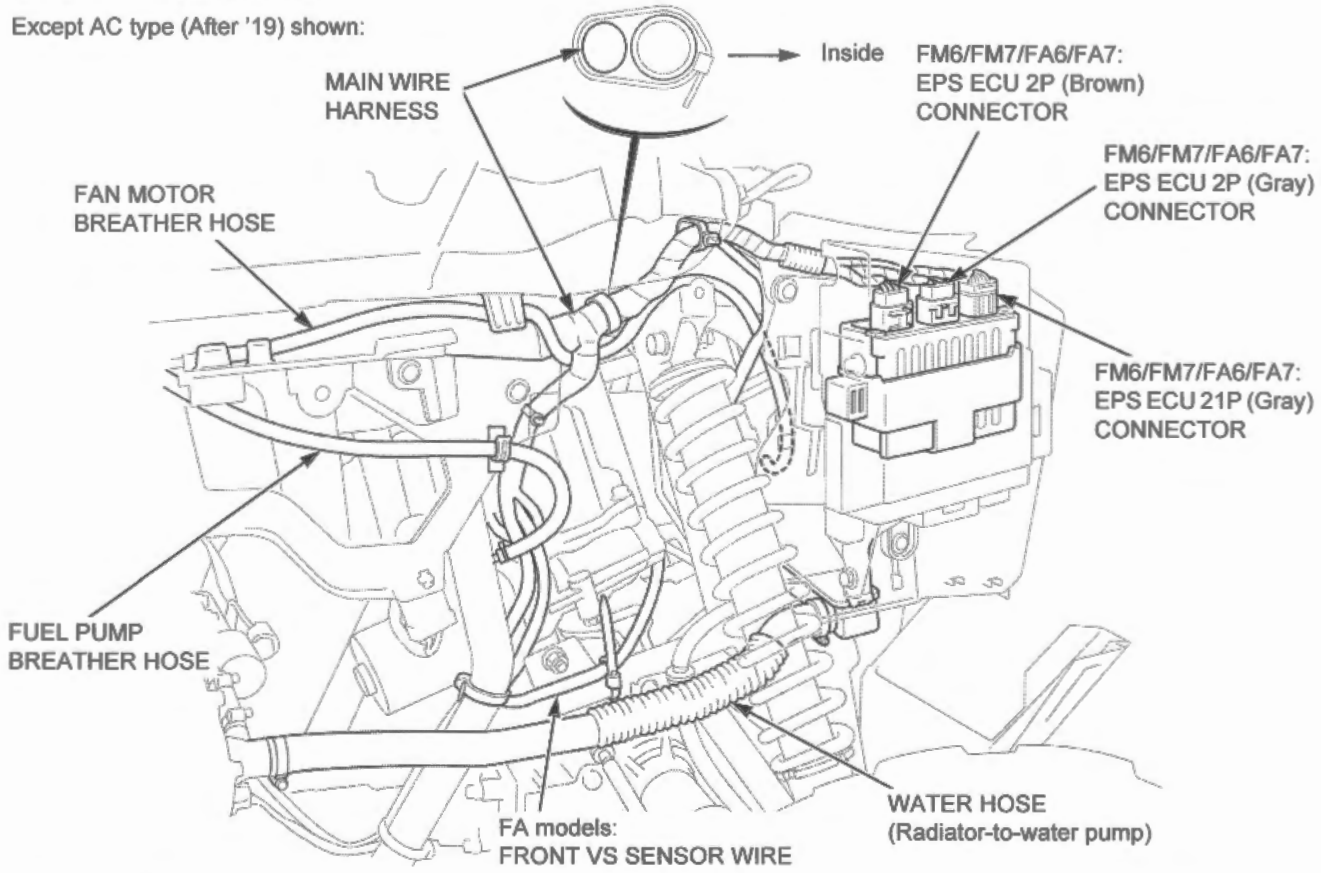
'14 – '19 shown:



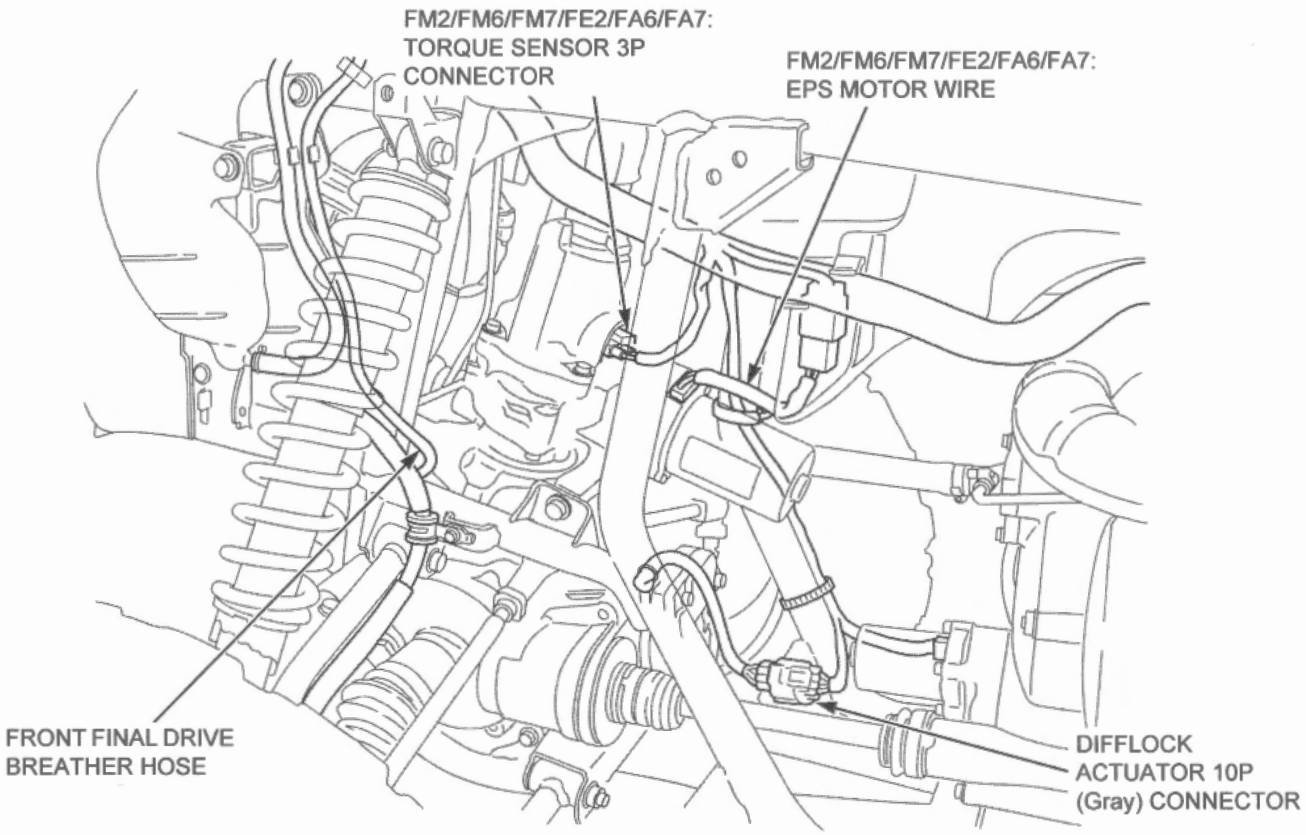
FM1/FM2/FE1/FE2:



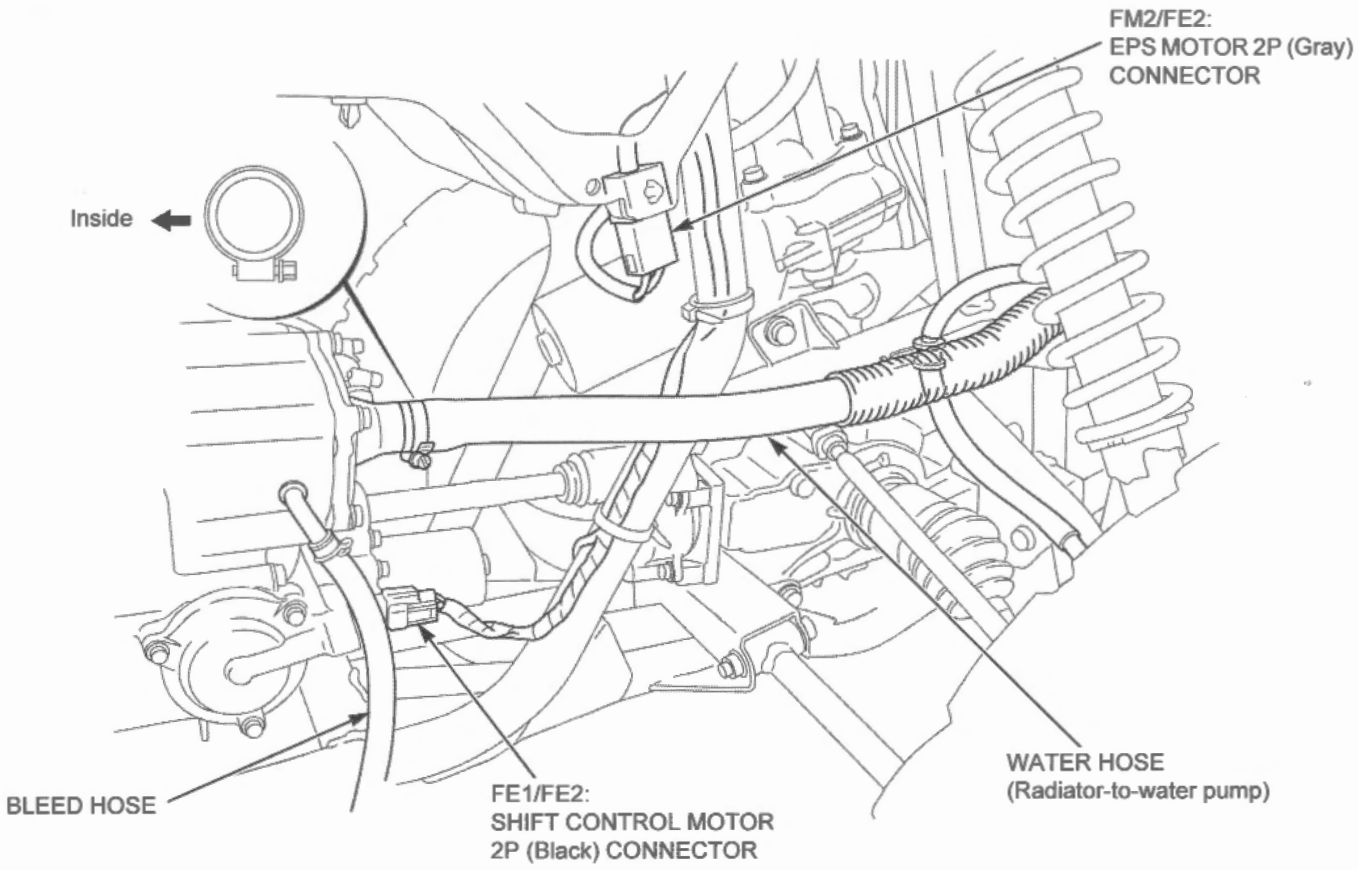
FM5/FM6/FM7/FA5/FA6/FA7:



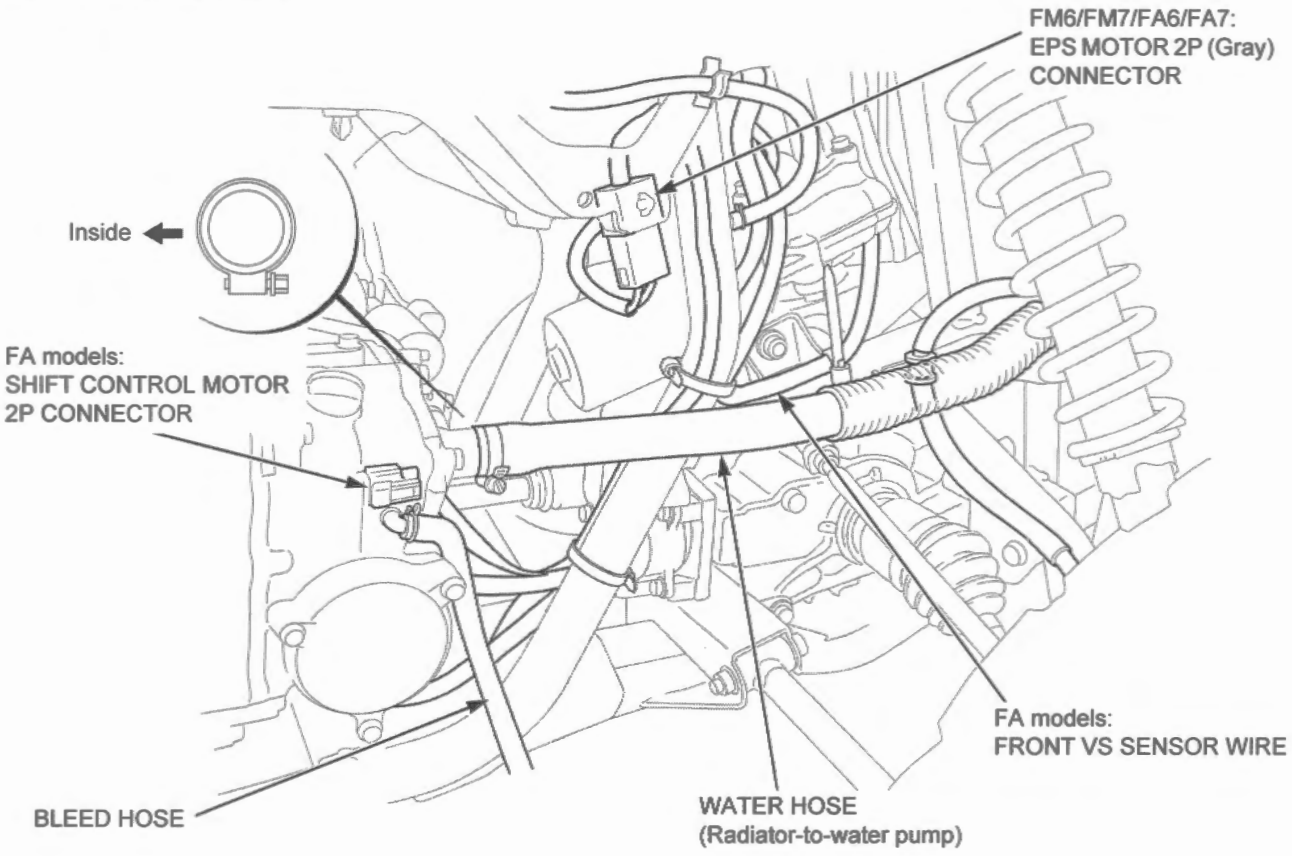
All models:



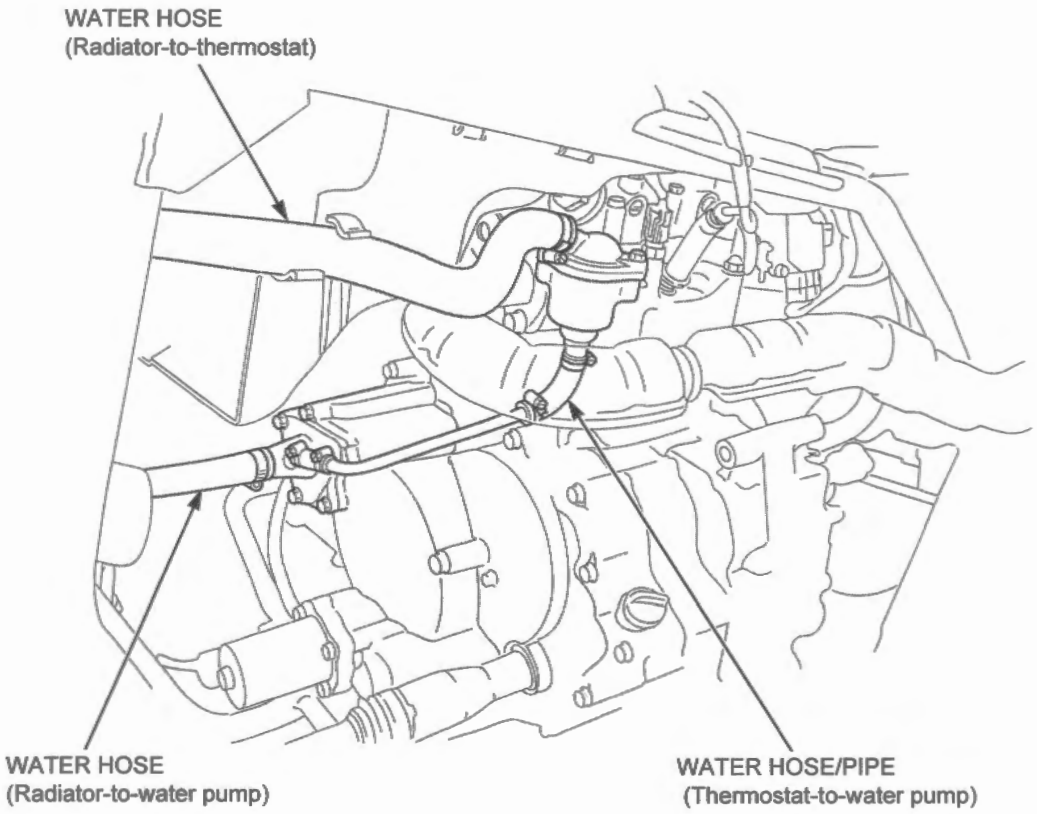
FM1/FM2/FE1/FE2:



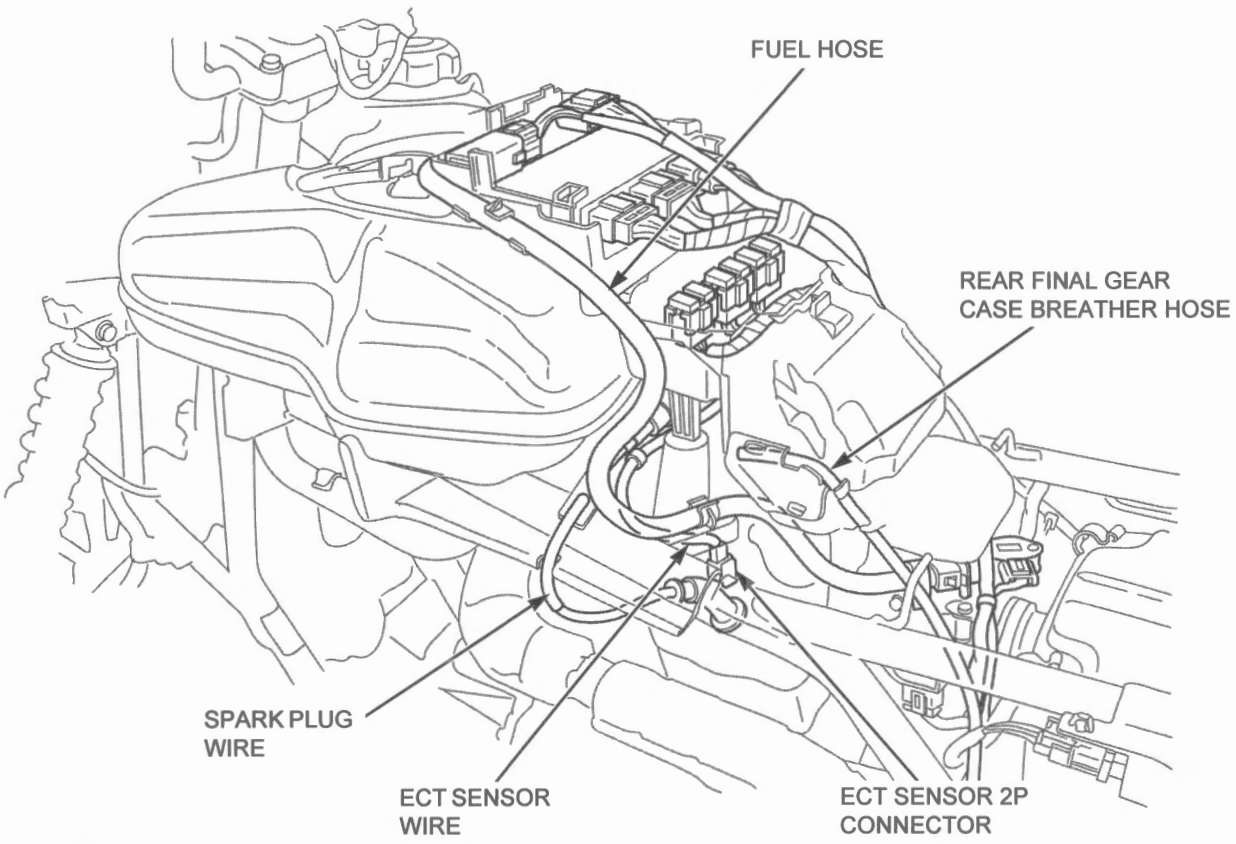
FM5/FM6/FM7/FA5/FA6/FA7:



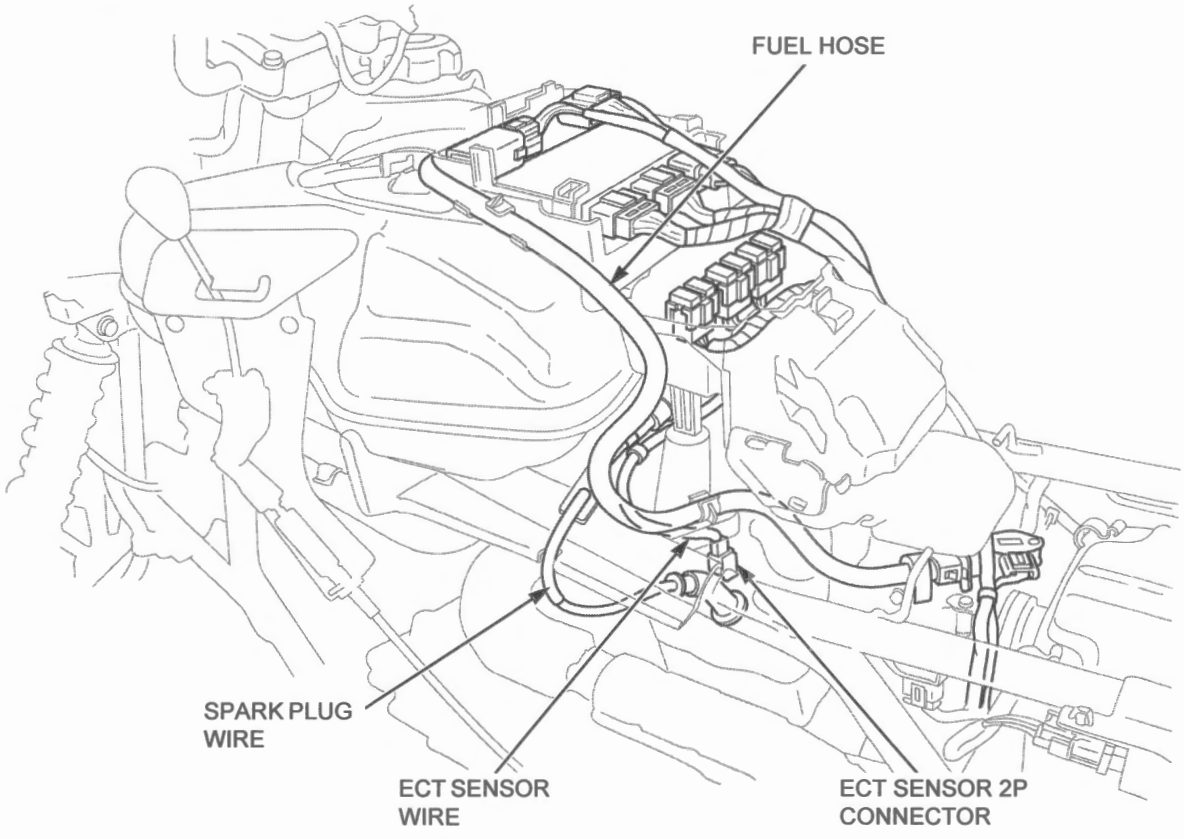
All models:



FM1/FM2/FE1/FE2:

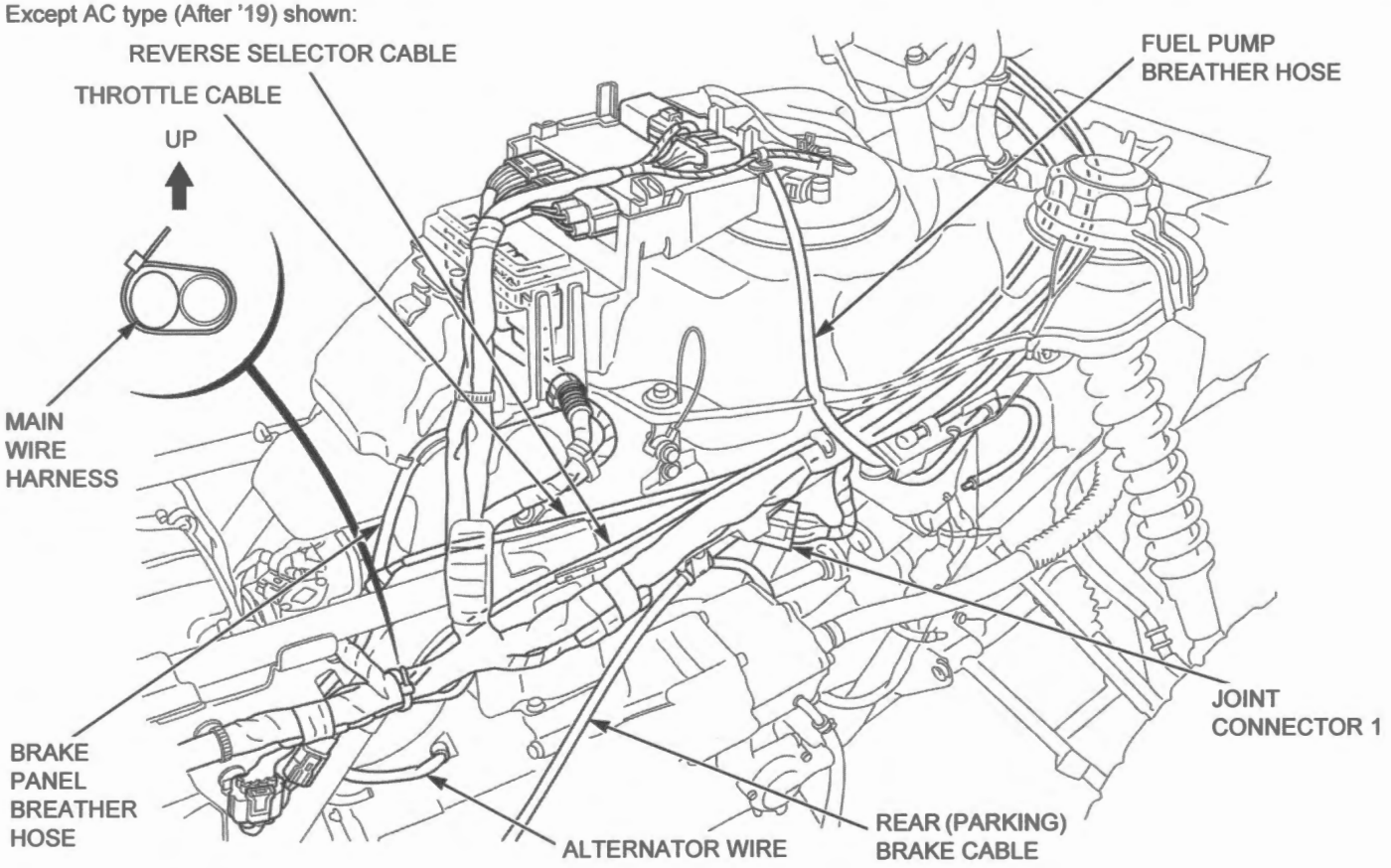


FM5/FM6/FM7/FA5/FA6/FA7:



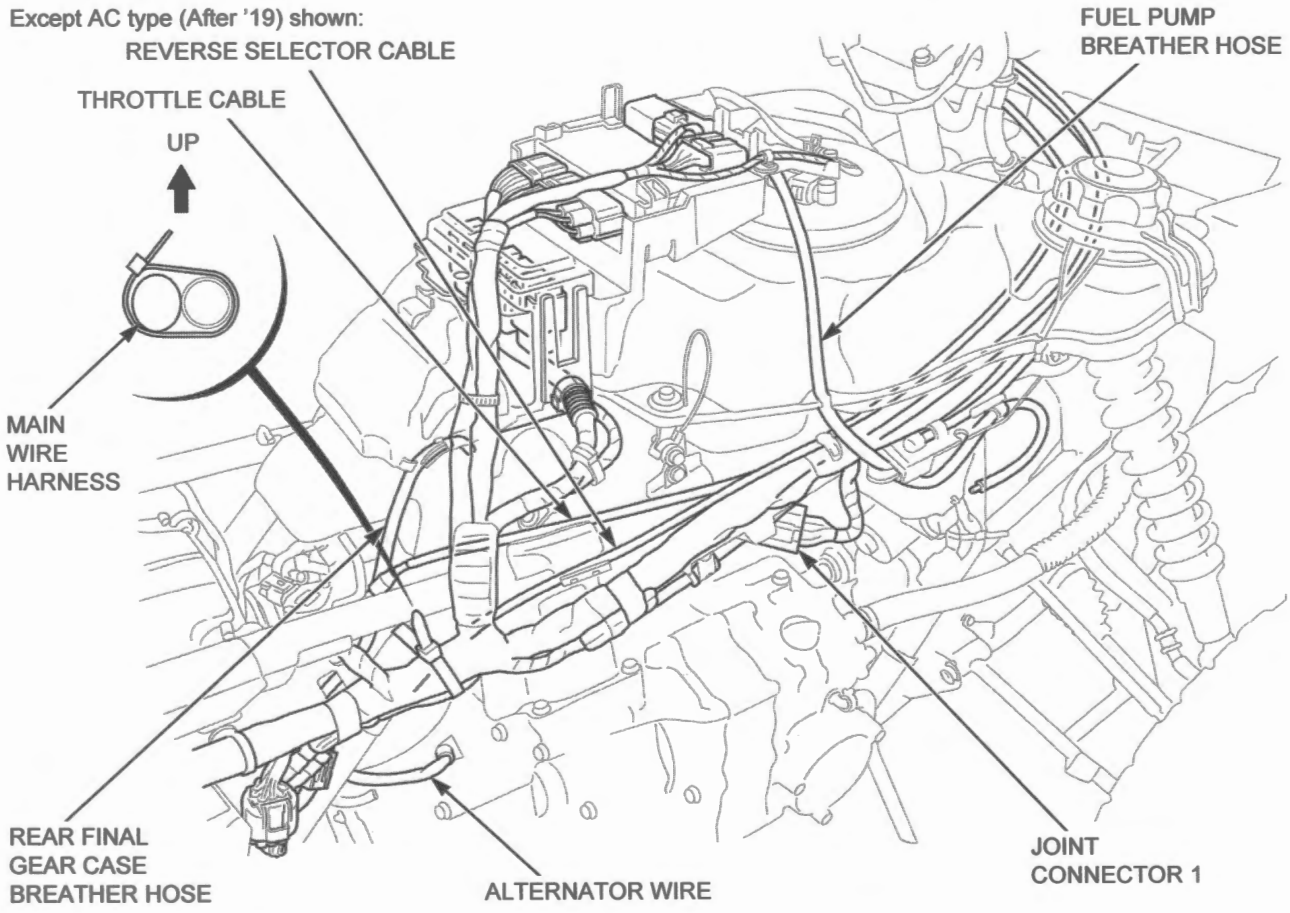
FM1/FM2/FE1/FE2:

Except AC type (After '19) shown:

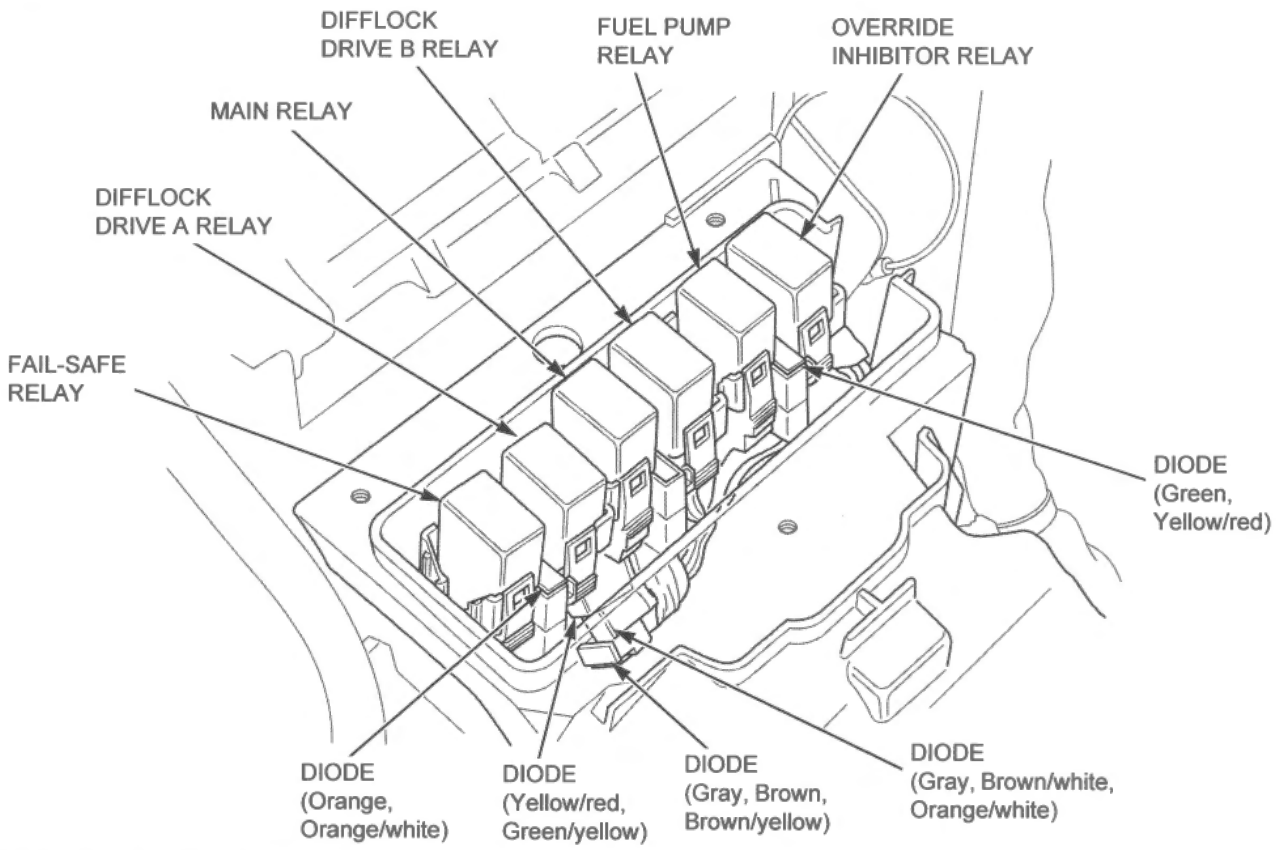


FM5/FM6/FM7/FA5/FA6/FA7:

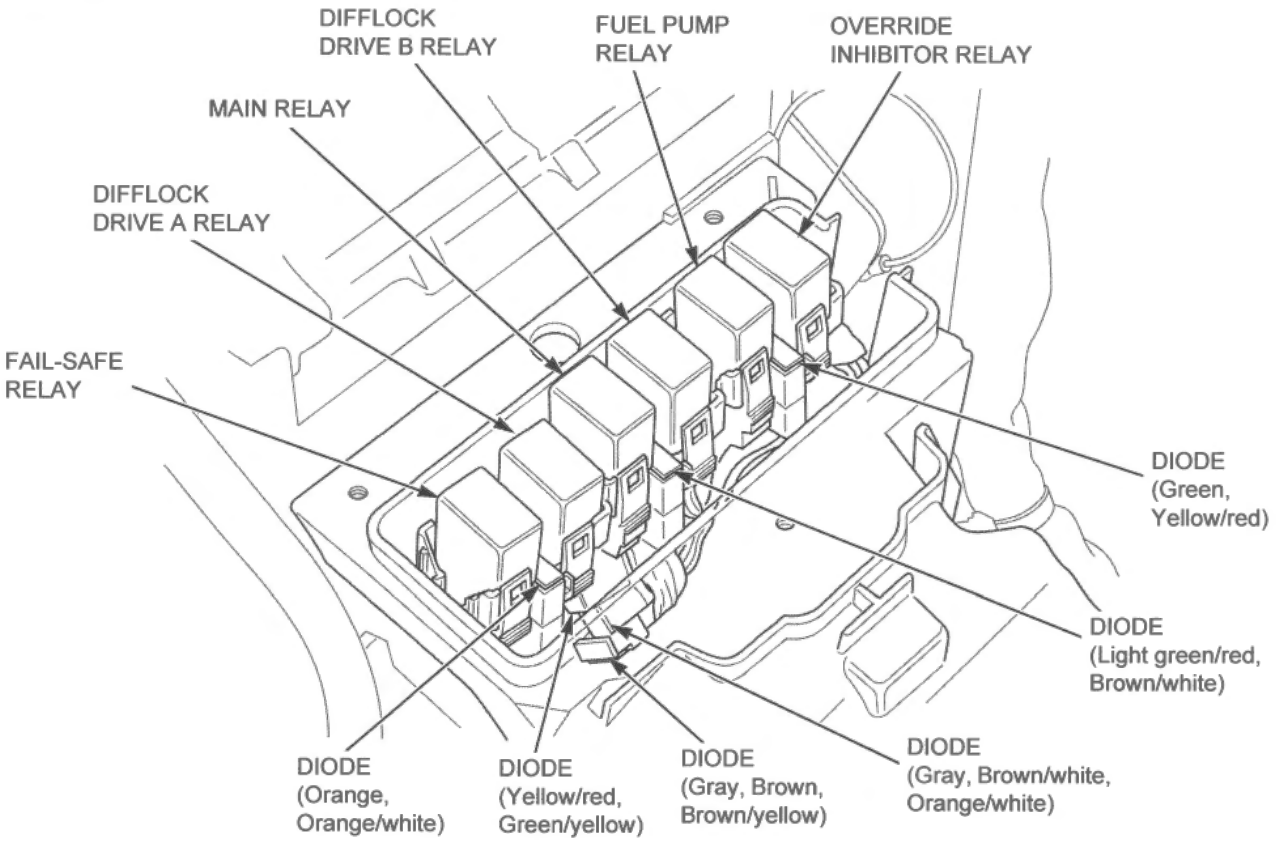
Except AC type (After '19) shown:



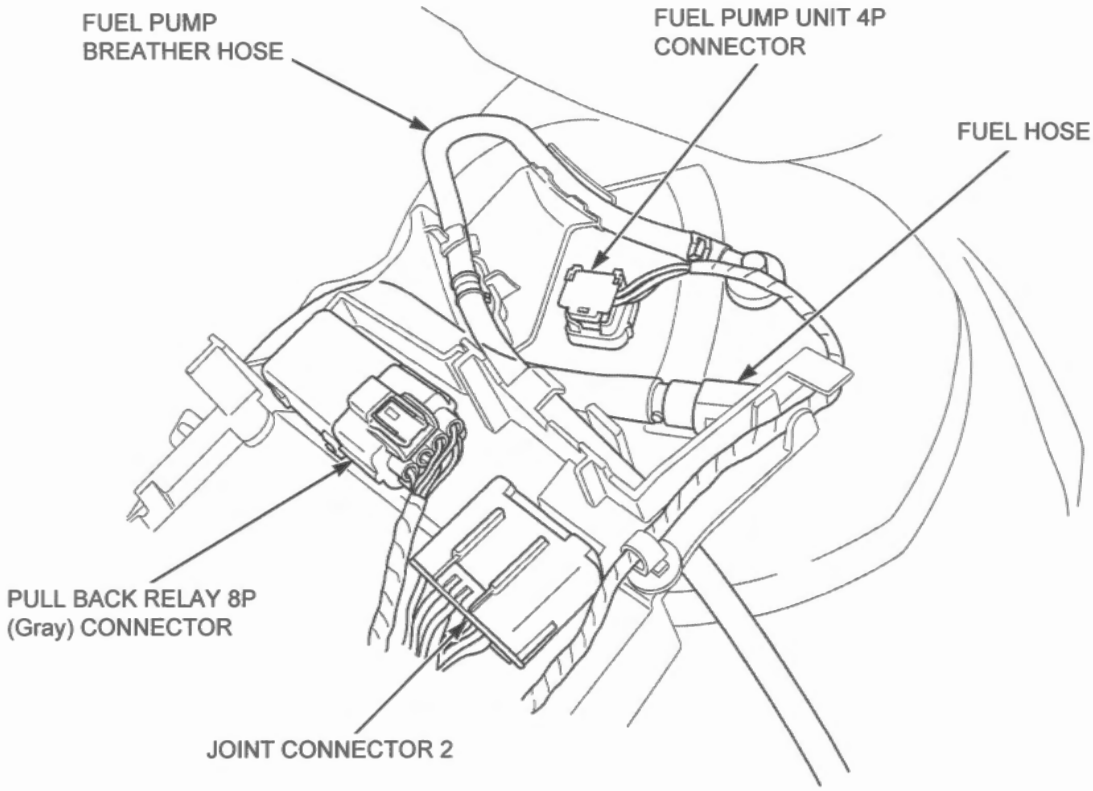
FM1/FM2/FE1/FE2 ('14):



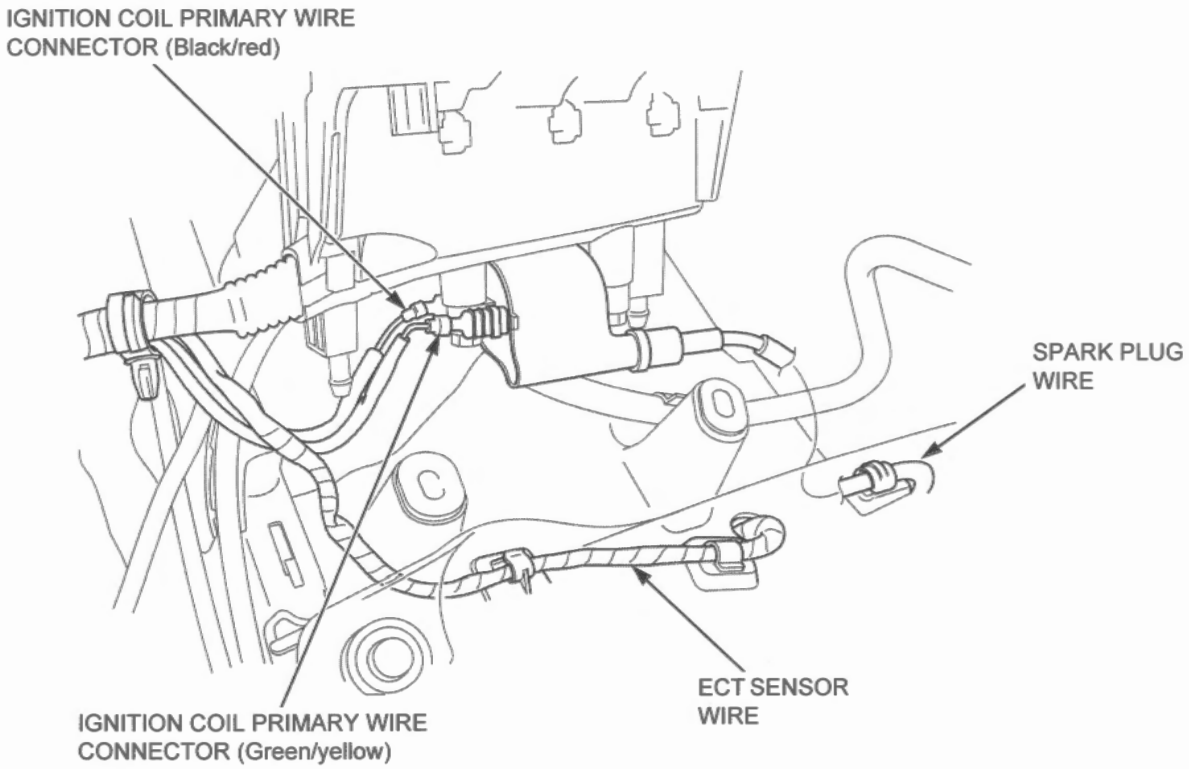
FM5/FM6/FM7/FA5/FA6/FA7 and FM1/FM2/FE1/FE2 (After '14):



All models:

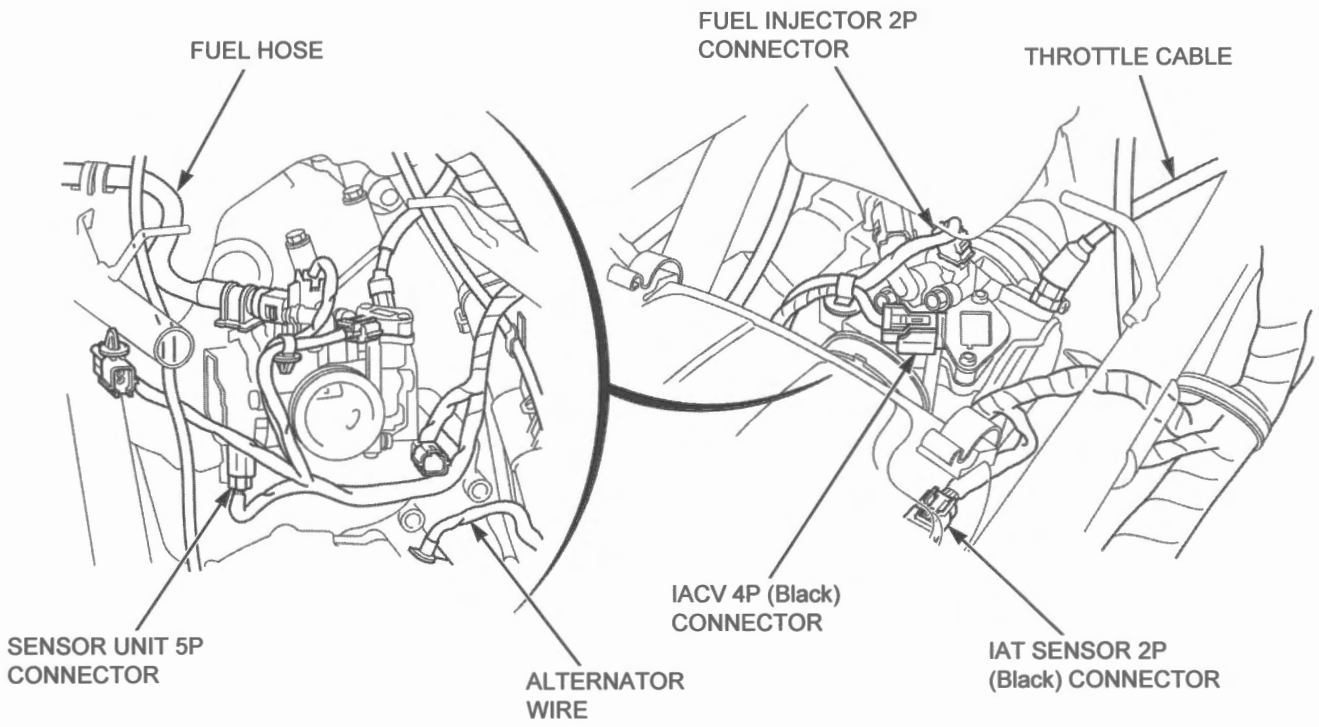


All models:

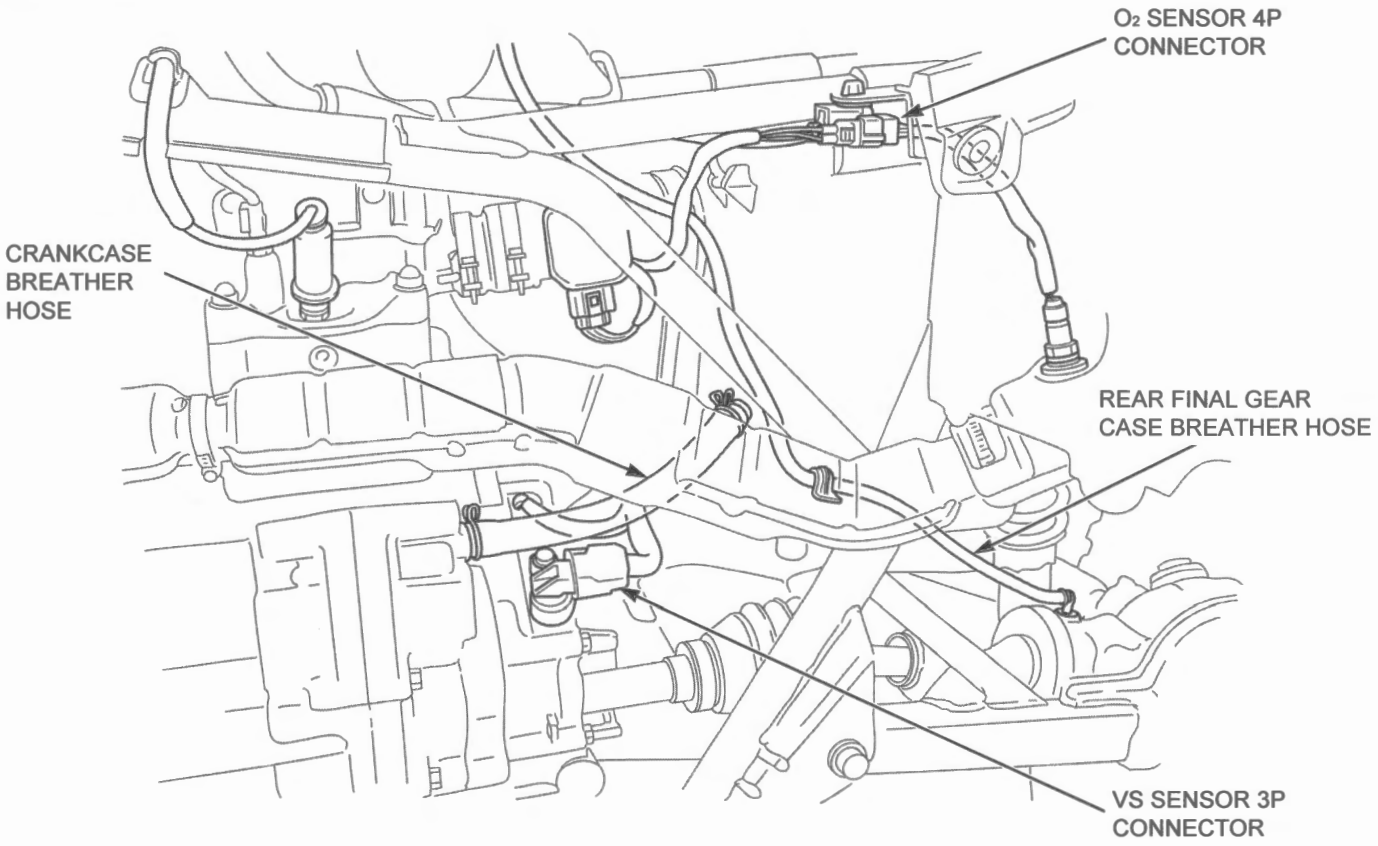


All models:

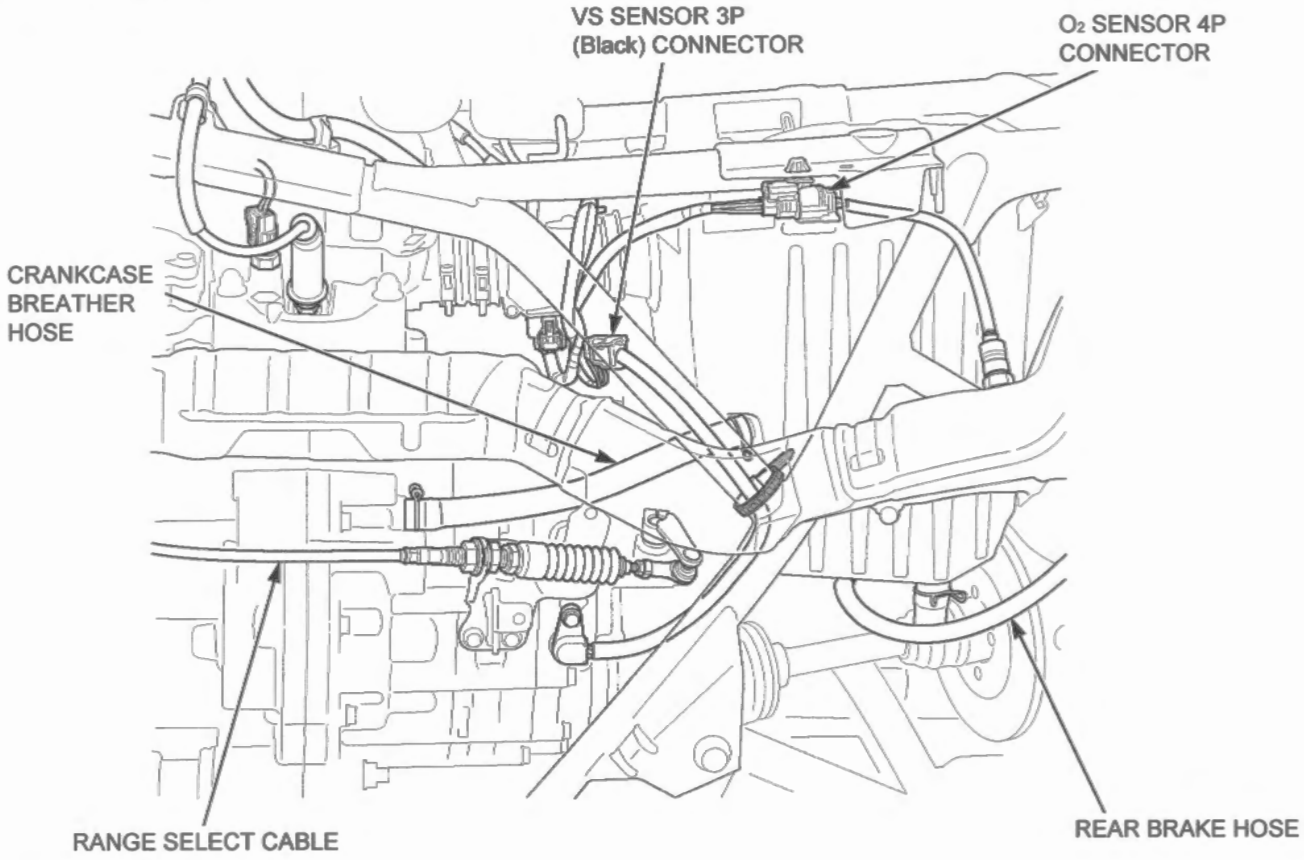
Except AC type (After '19) shown:



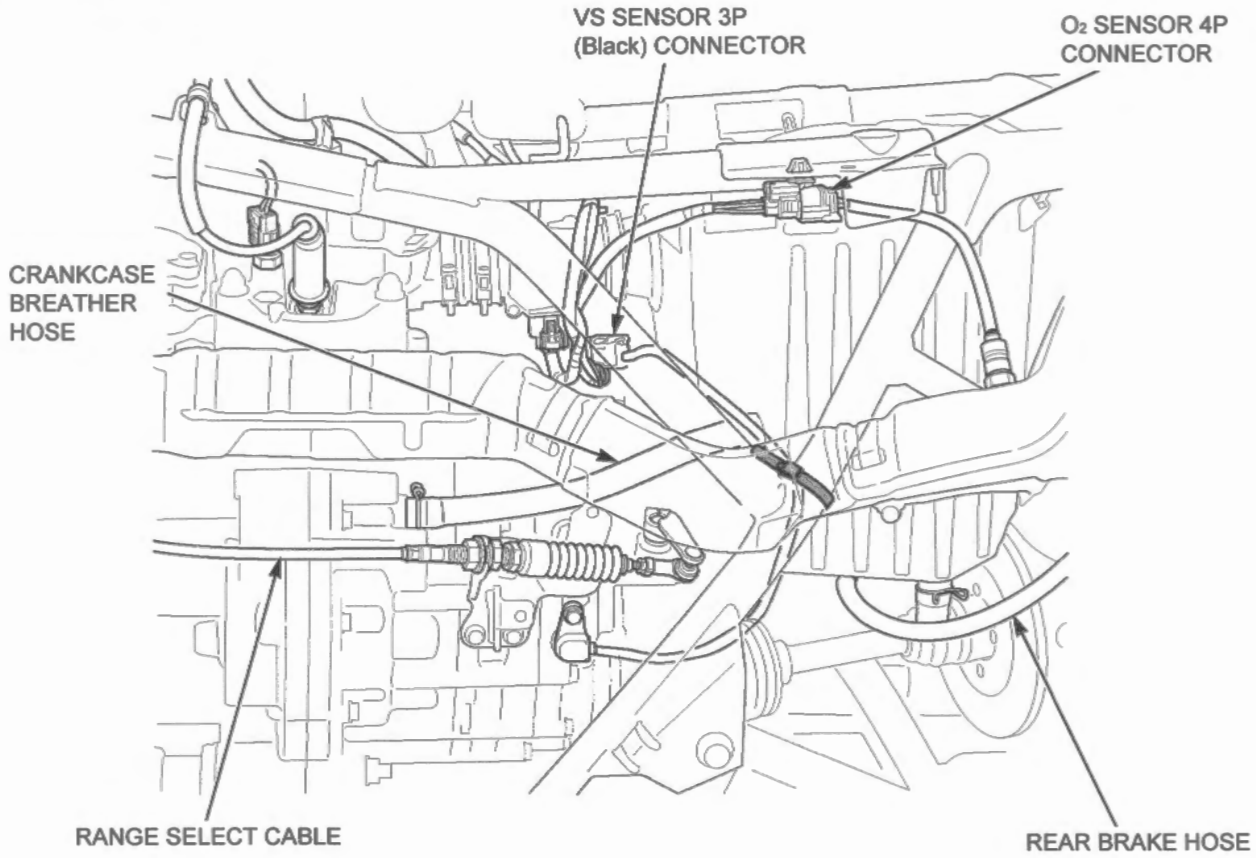
FM/FE models:



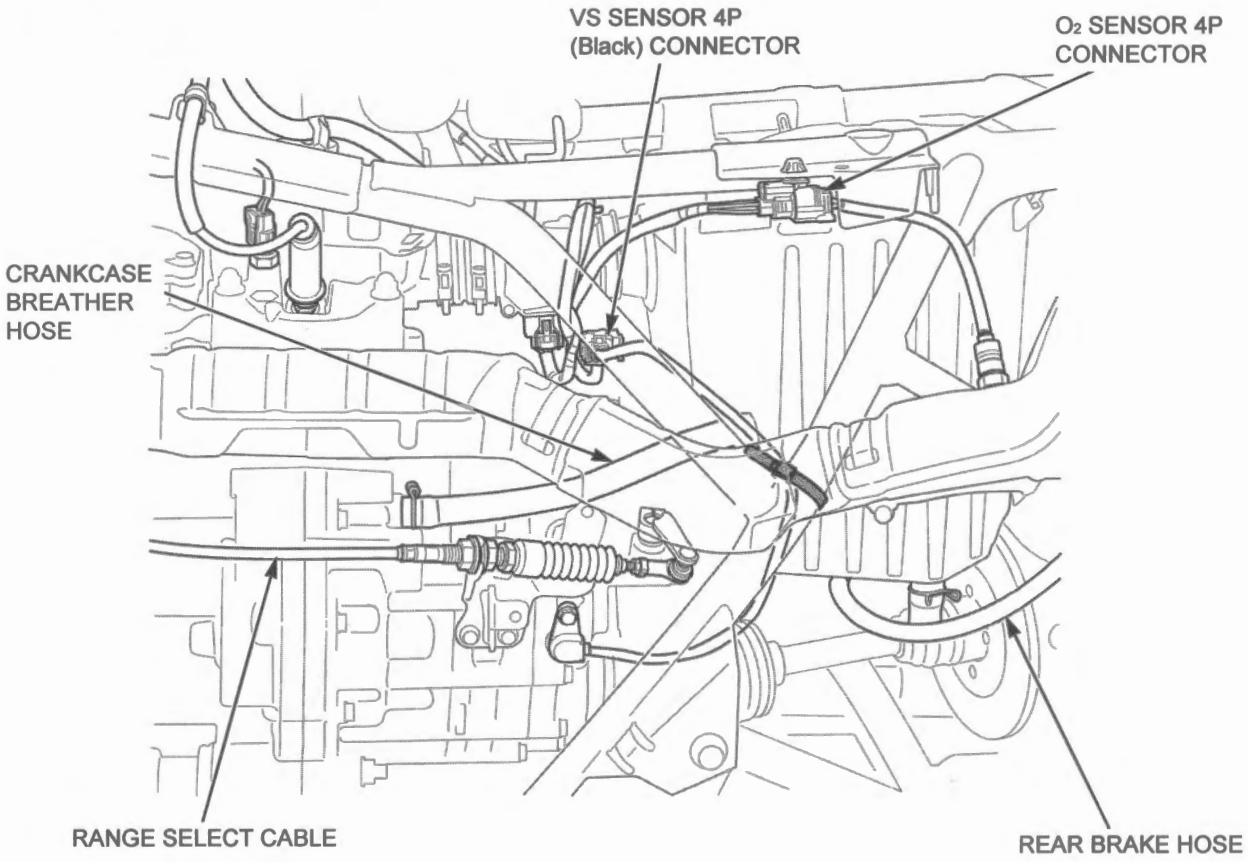
FA models ('15 – '19):



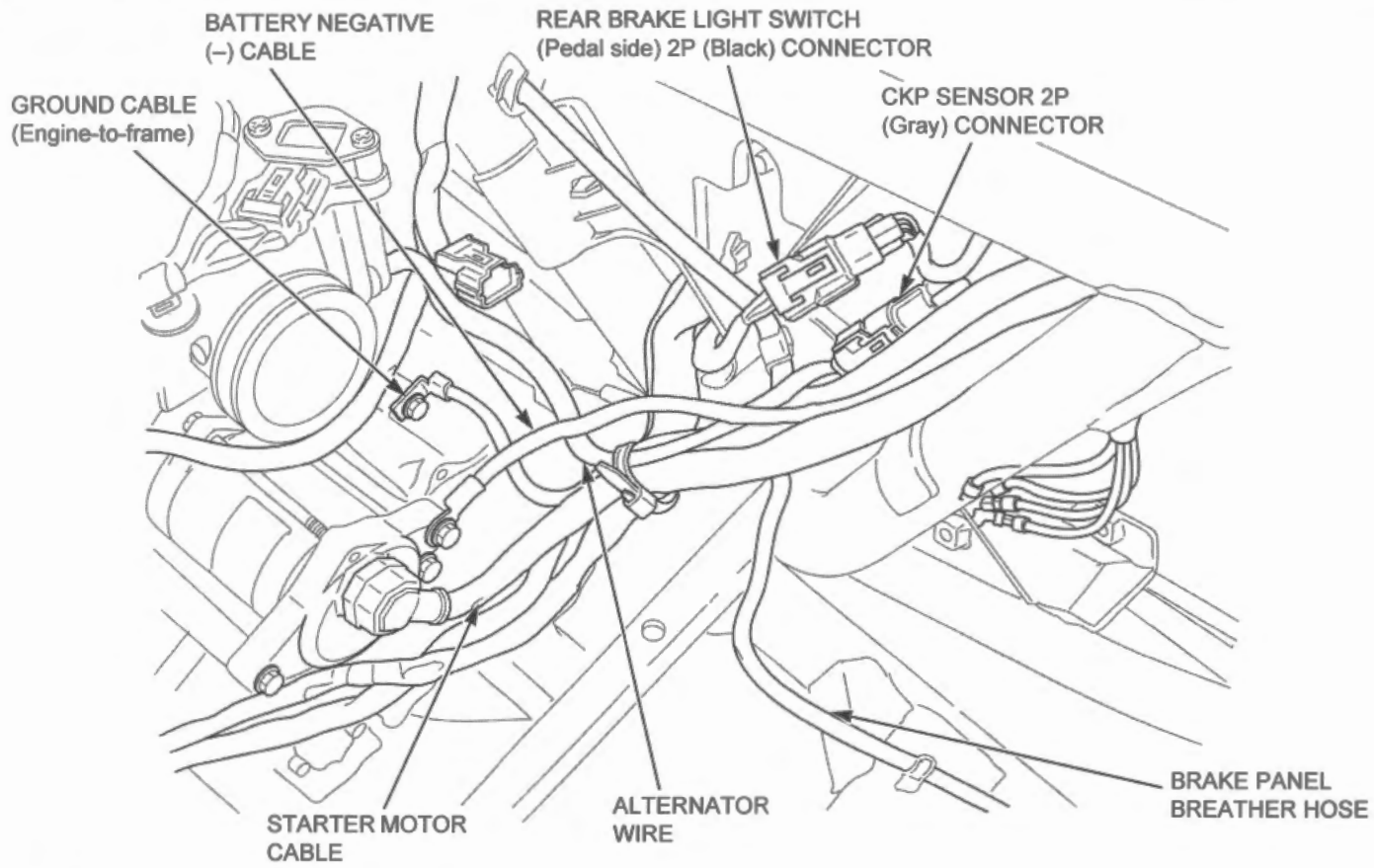
FA models ('20 – '21):



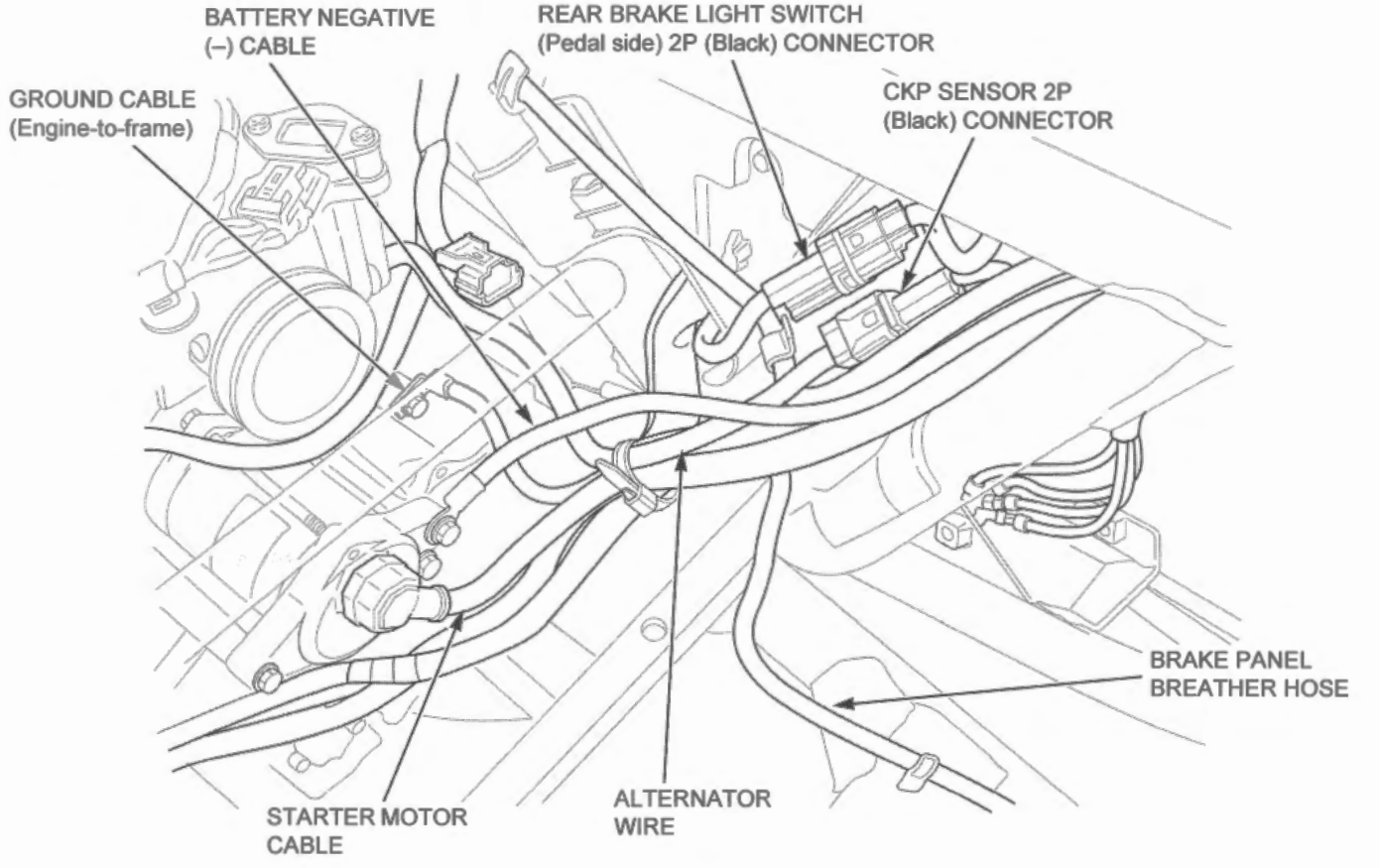
FA models (After '21):



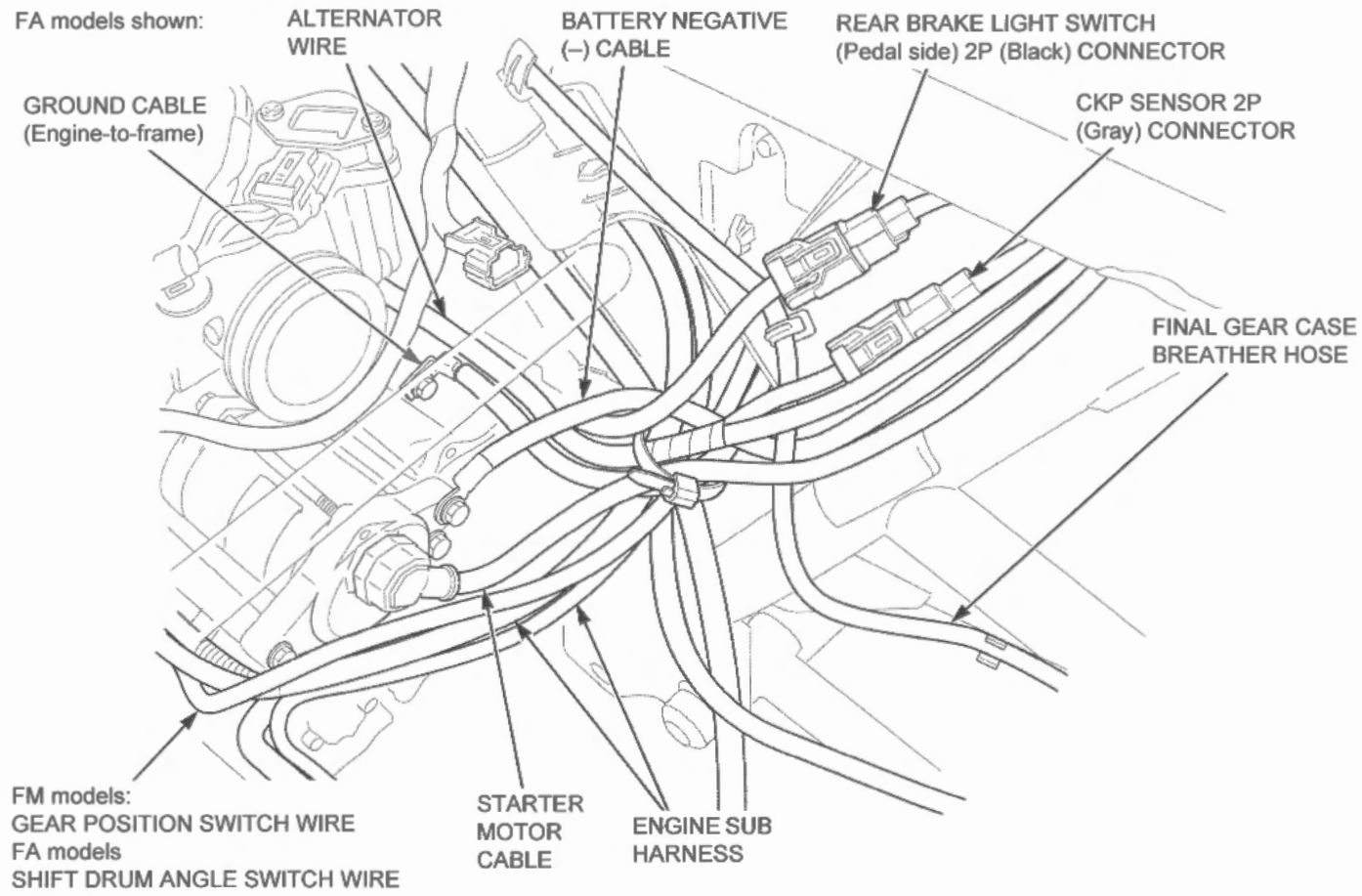
FM1/FM2/FE1/FE2 ('14 – '21):



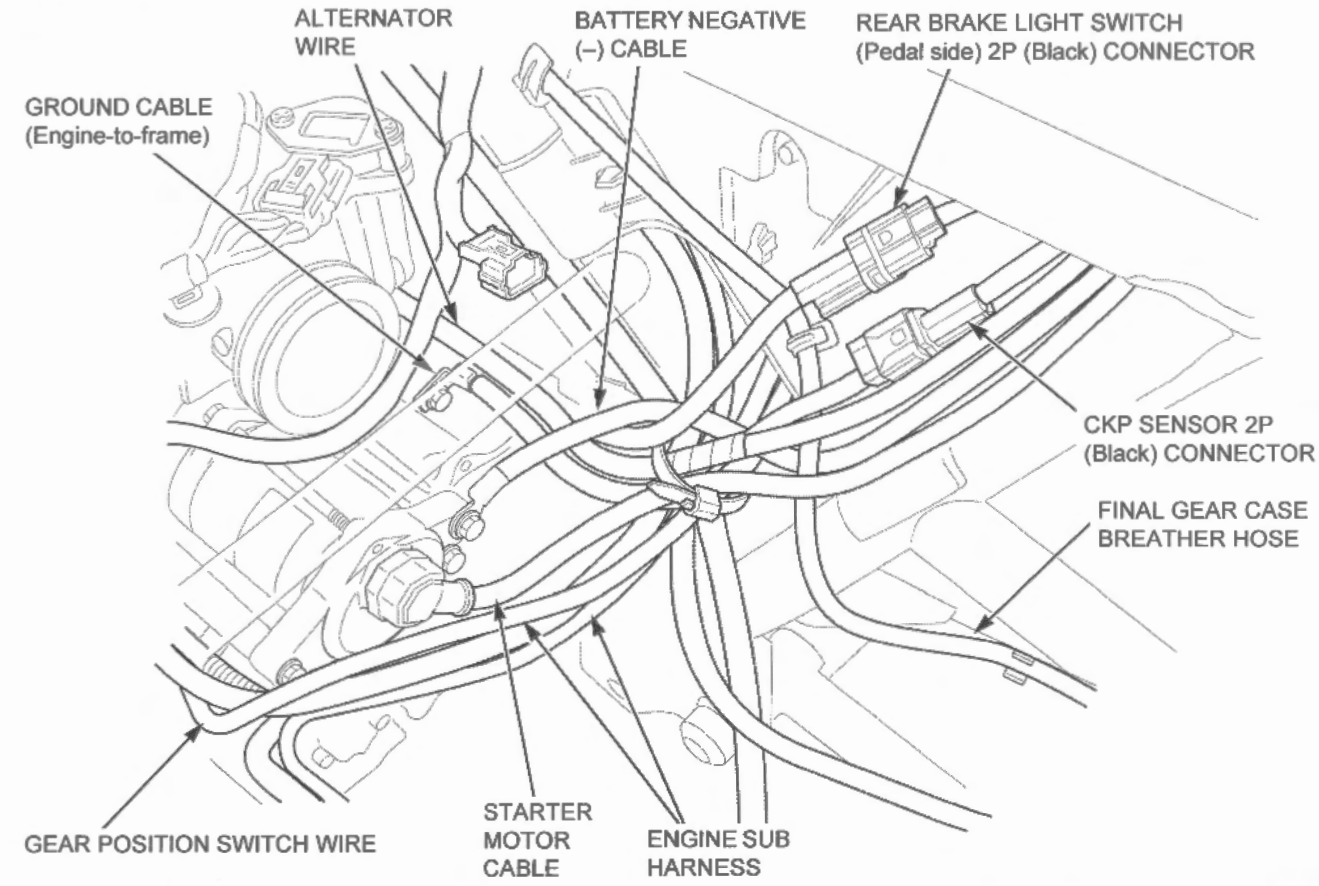
FM1/FM2/FE2 (After '21):



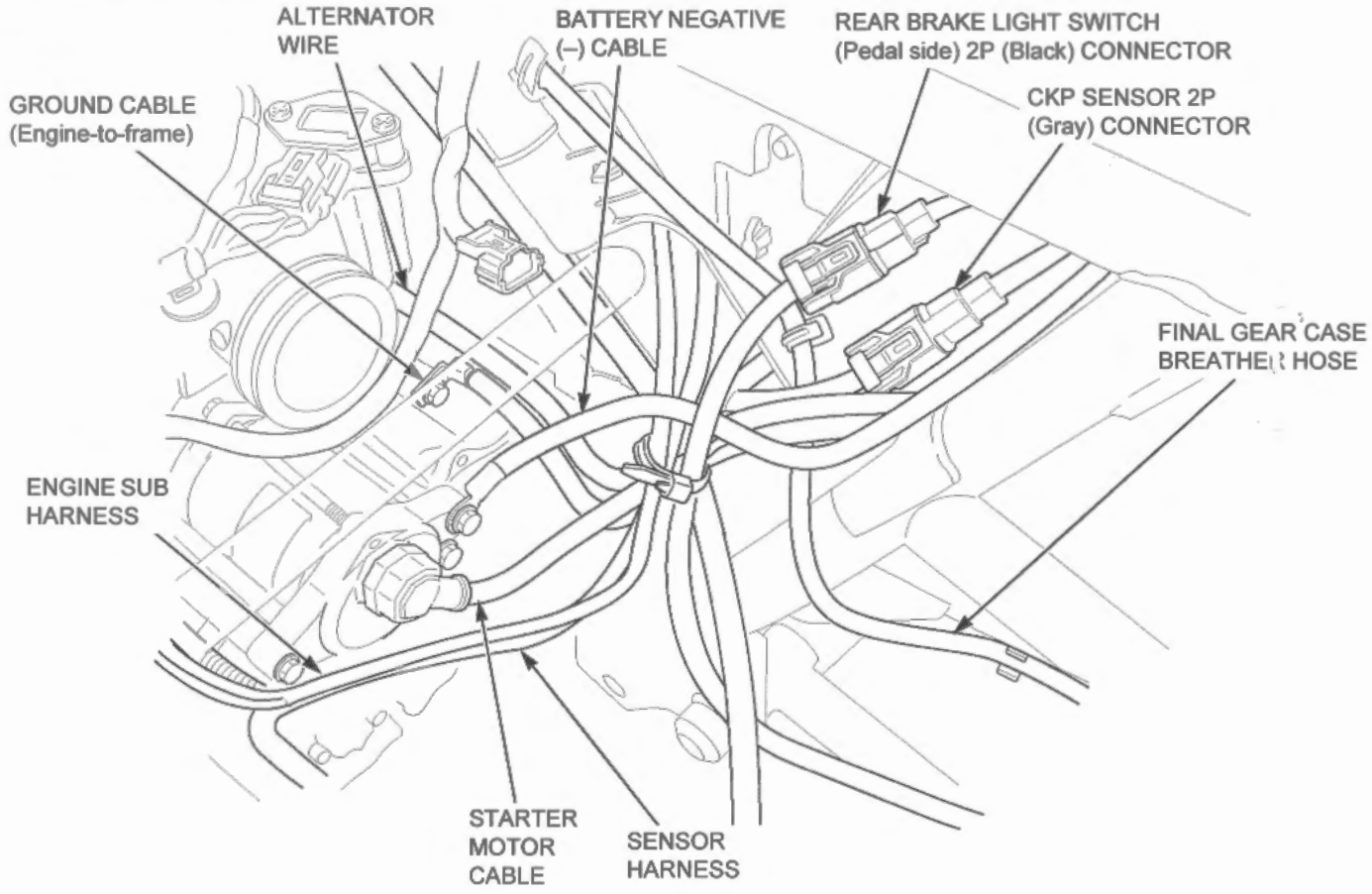
FM5/FM7/FA5/FA6/FA7 ('15 – '19) and FM6 ('15 – '21):



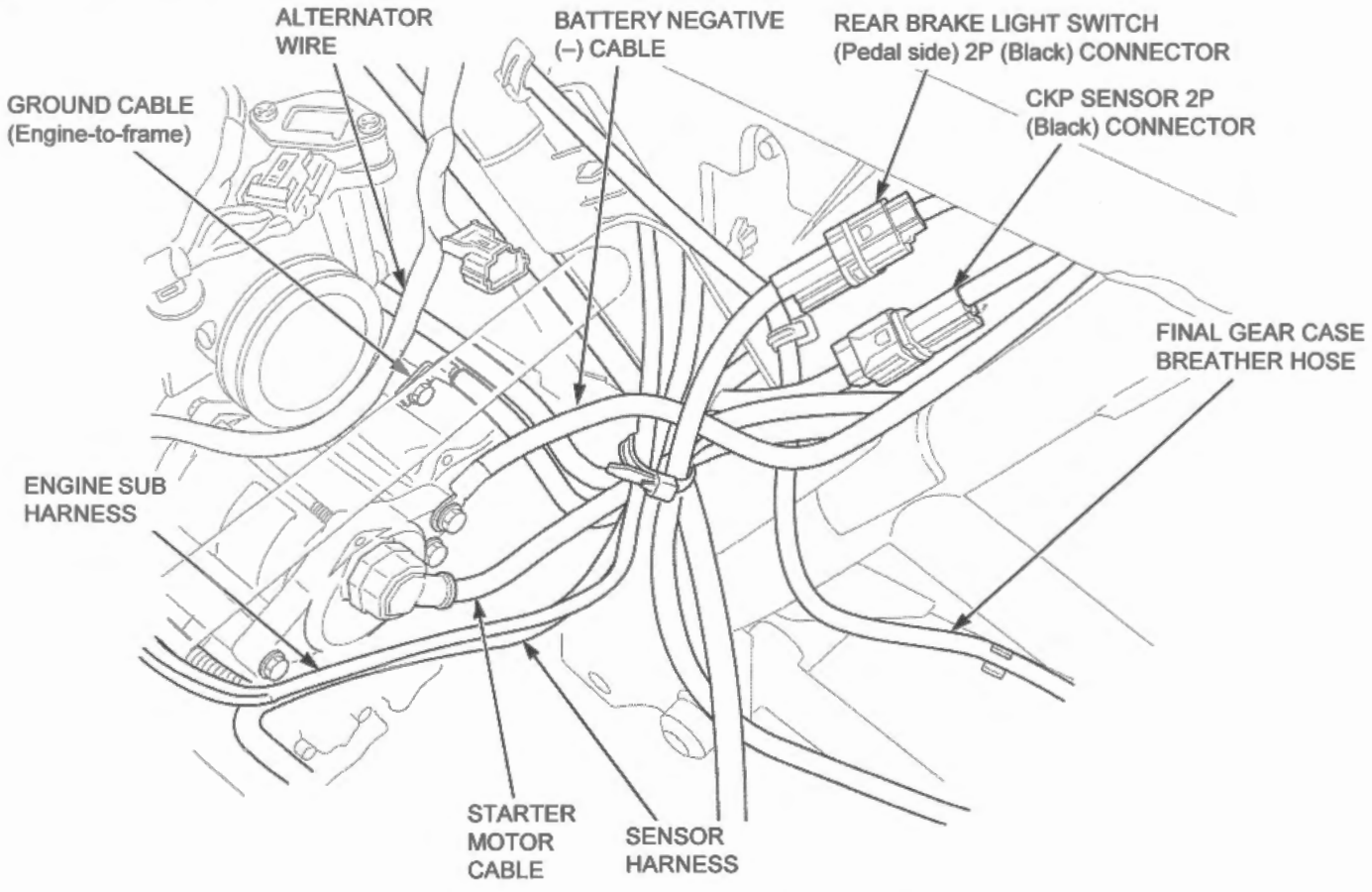
FM6 (After '21):



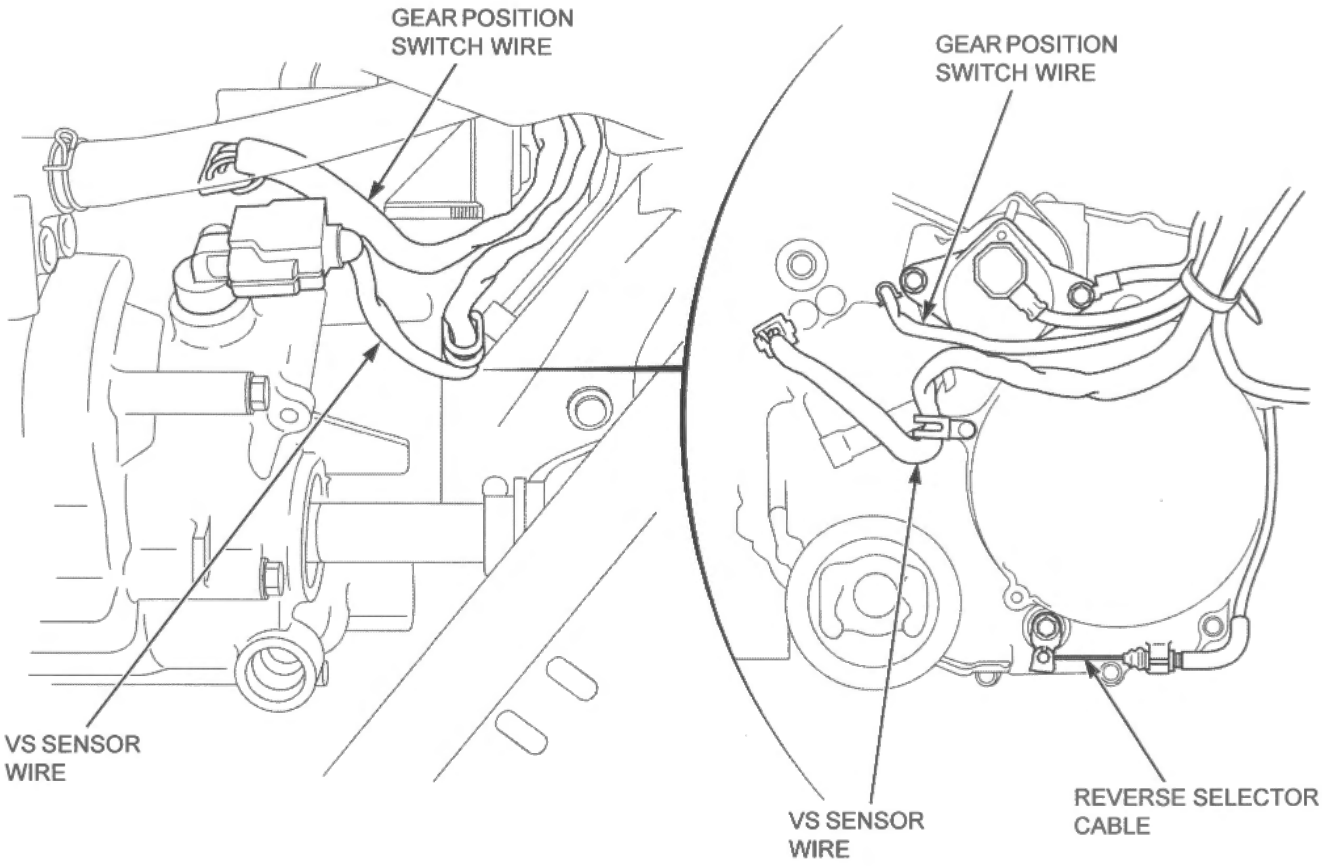
FA5/FA6/FA7 ('20 – '21):



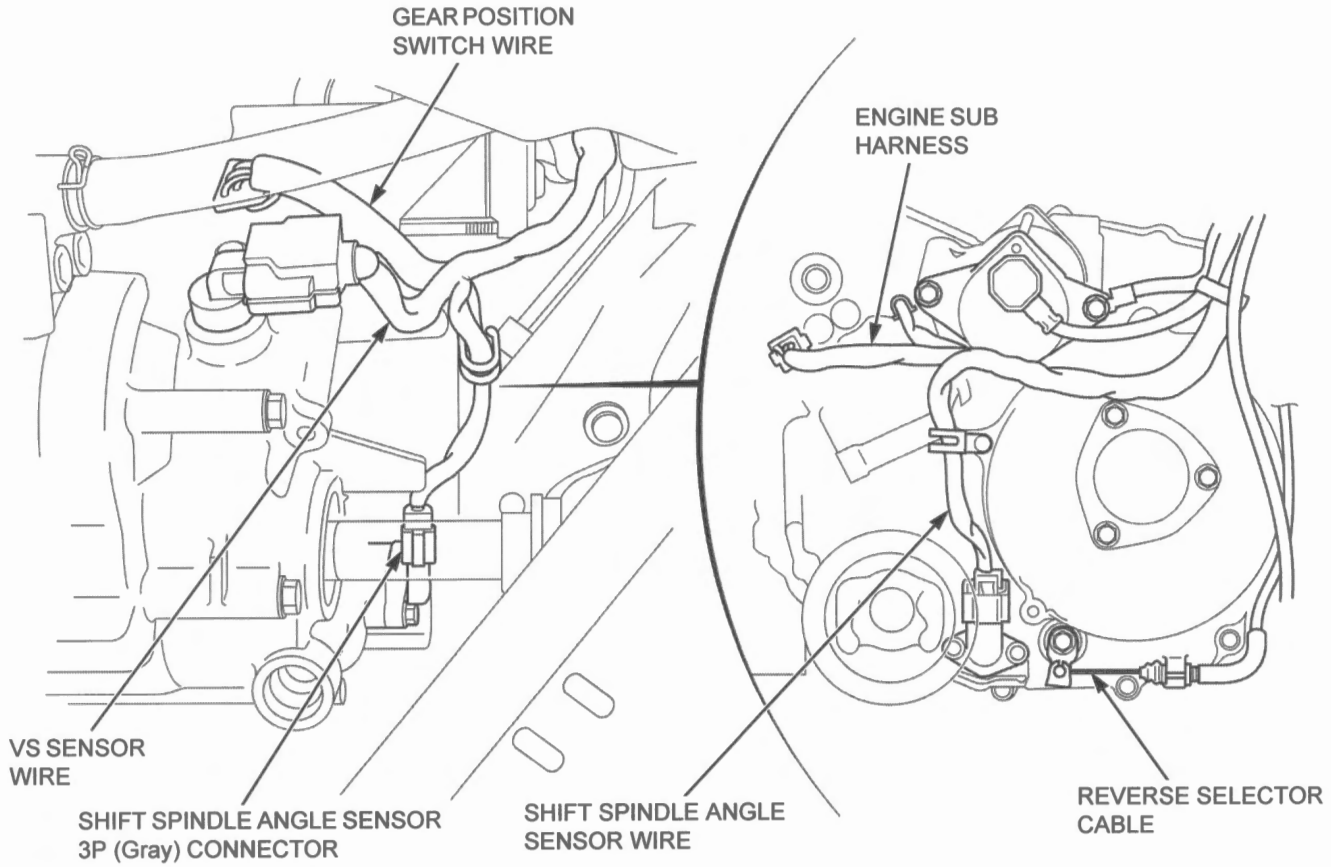
FA5/FA6/FA7 (After '21):



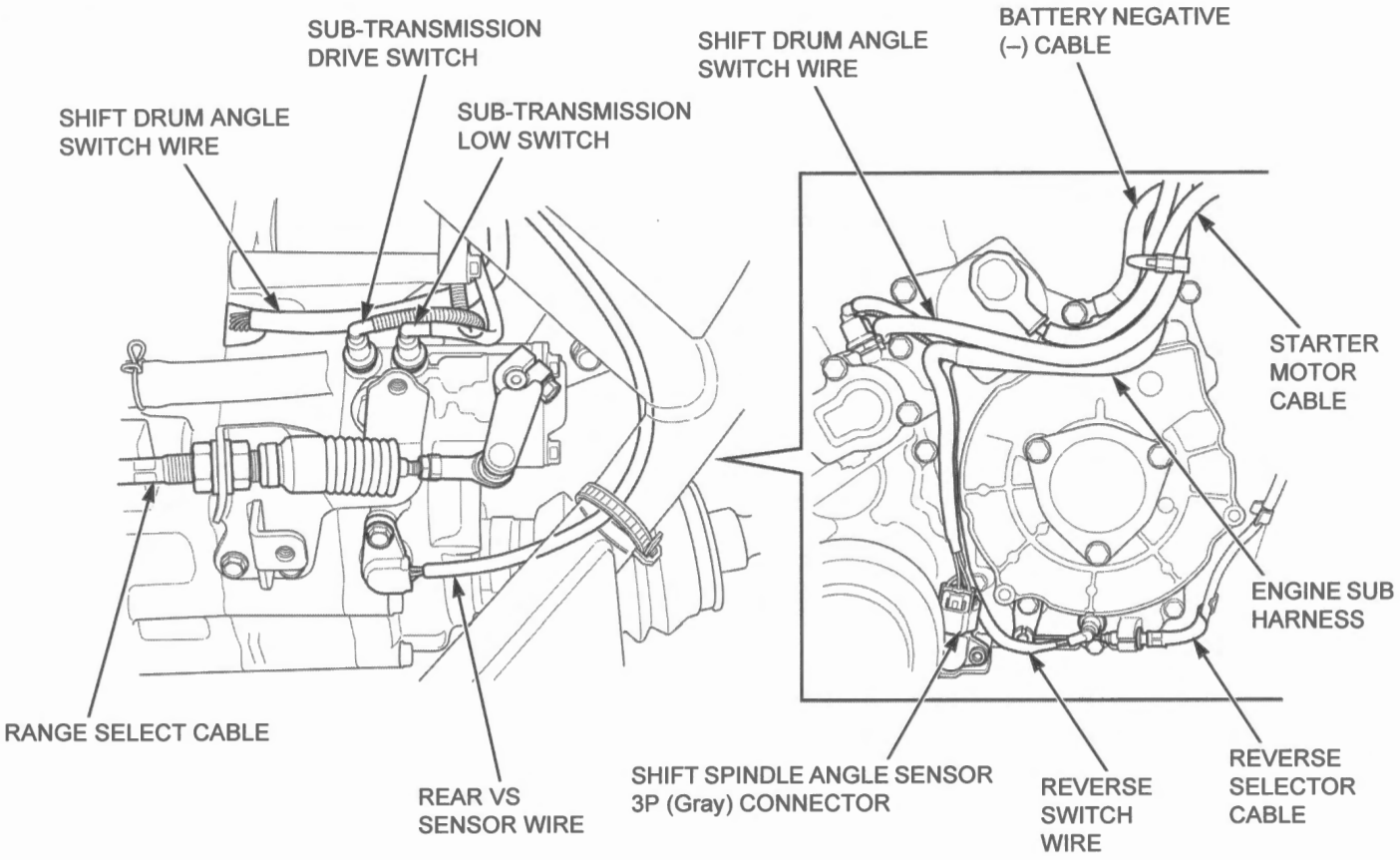
FM models:


GEAR POSITION
SWITCH WIRE
VS SENSOR
WIRE
GEAR POSITION
SWITCH WIRE
VS SENSOR
WIRE
REVERSE SELECTOR
CABLE

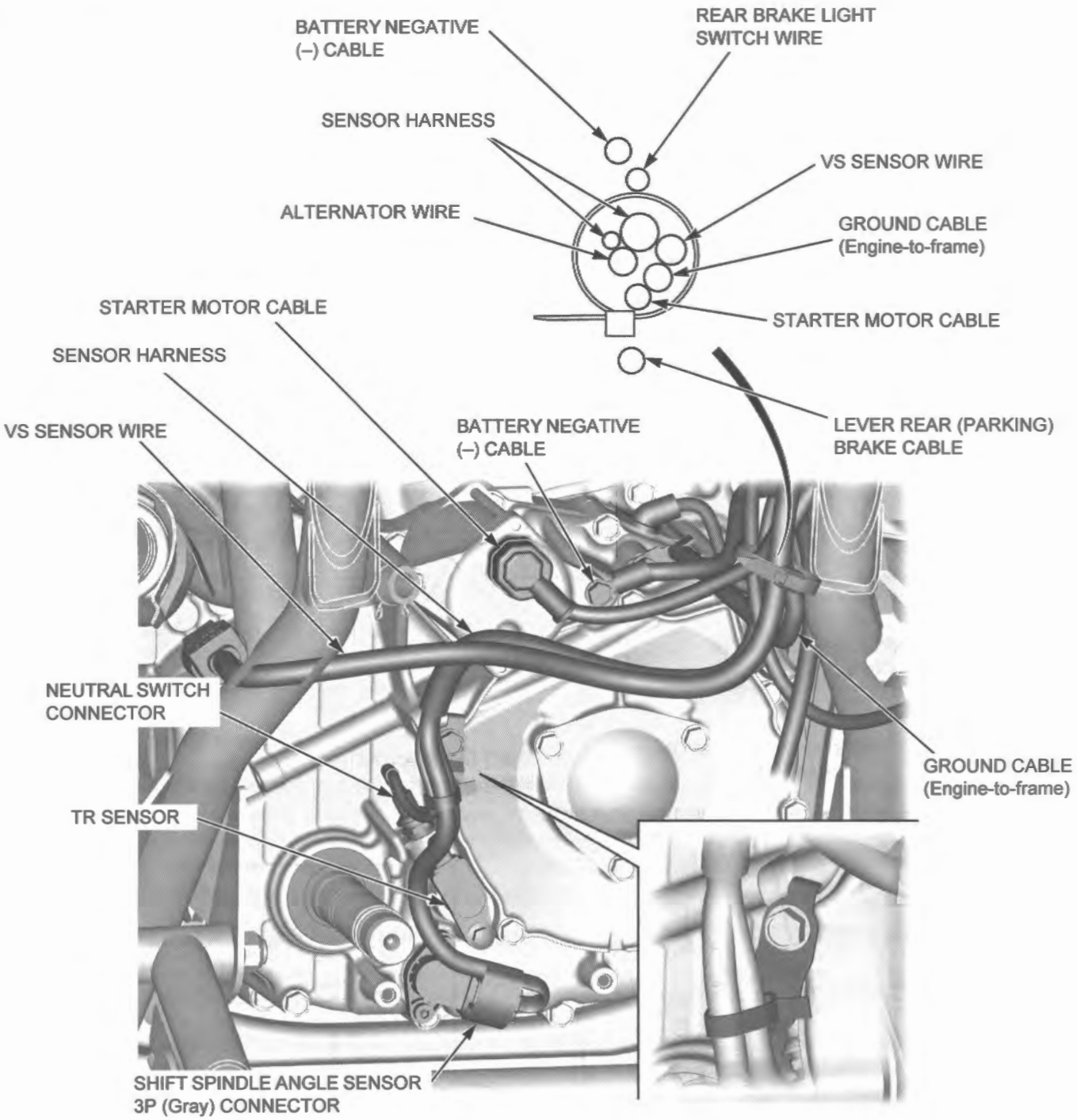
FE models ('14 – '19):



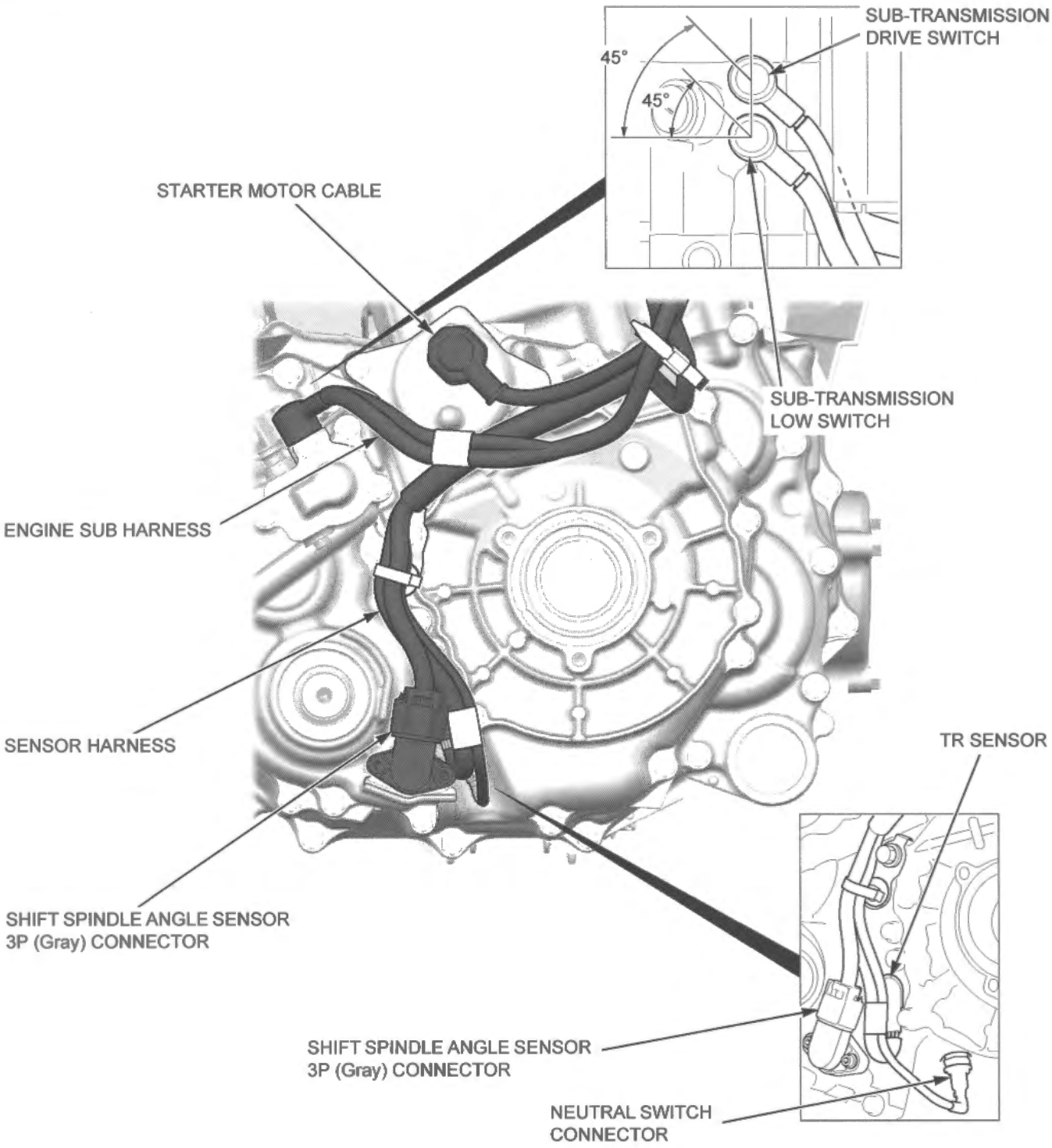
FA models ('15 – '19):



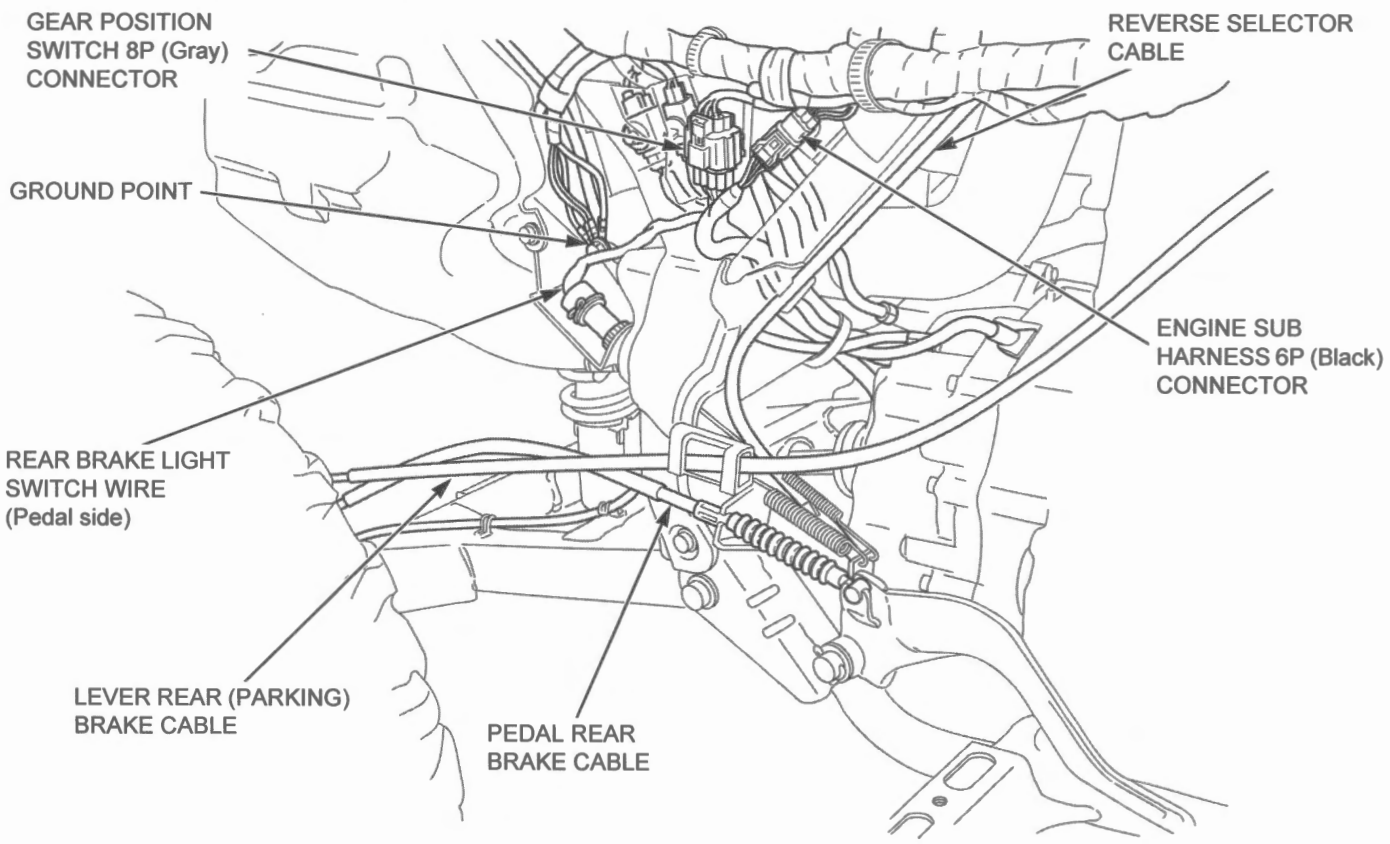
FE2 (After '19):


BATTERY NEGATIVE (–) CABLE
REAR BRAKE LIGHT SWITCH WIRE
SENSOR HARNESS
VS SENSOR WIRE
ALTERNATOR WIRE
GROUND CABLE (Engine-to-frame)
STARTER MOTOR CABLE
STARTER MOTOR CABLE
SENSOR HARNESS
LEVER REAR (PARKING) BRAKE CABLE
VS SENSOR WIRE
BATTERY NEGATIVE (–) CABLE
NEUTRAL SWITCH CONNECTOR
GROUND CABLE (Engine-to-frame)
TR SENSOR
SHIFT SPINDLE ANGLE SENSOR 3P (Gray) CONNECTOR

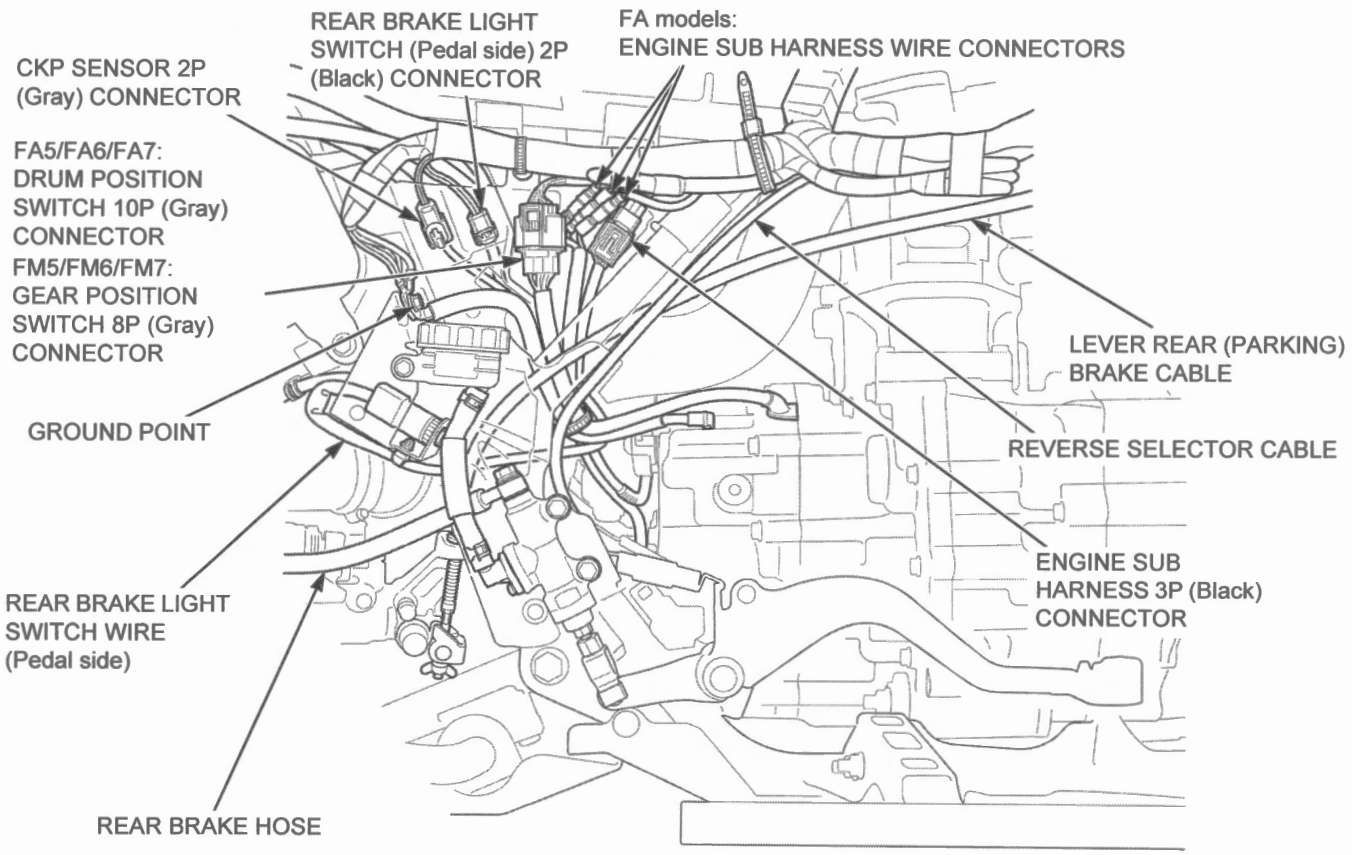
FA models (After '19):



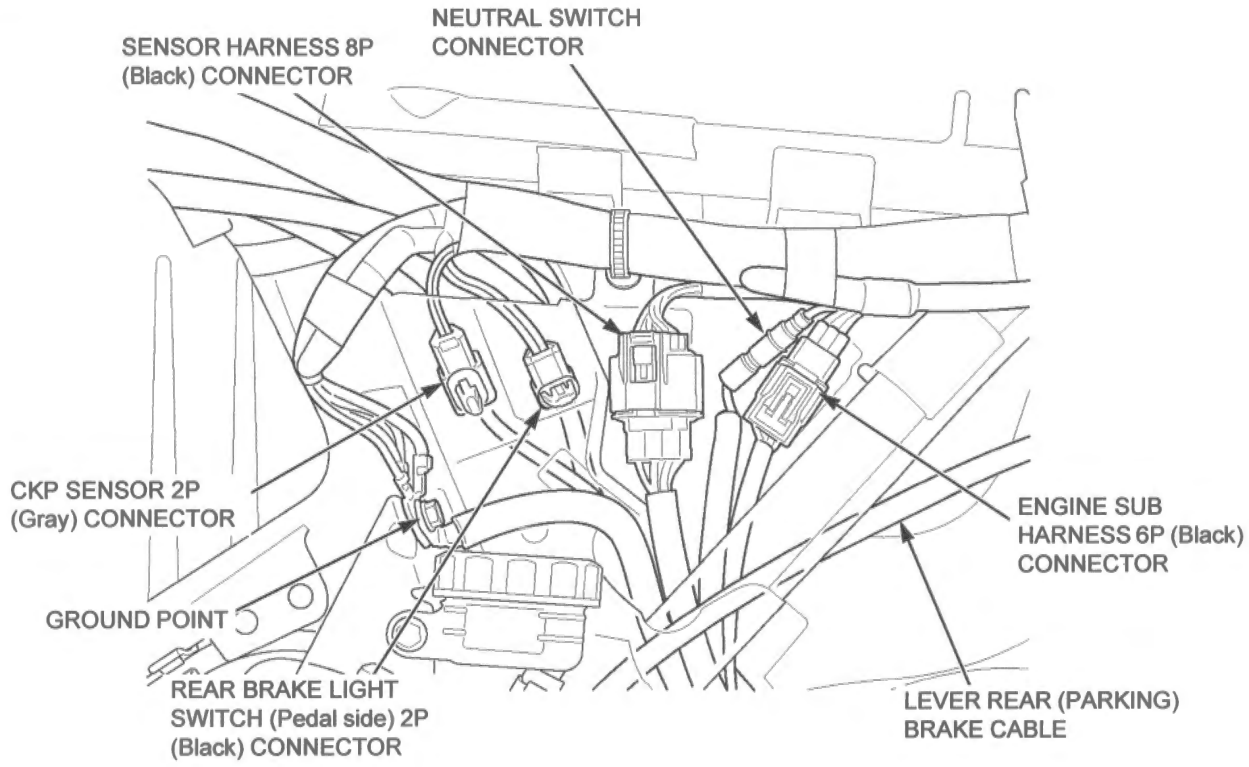
FM1/FM2/FE1 (All) and FE2 ('14 – '19):



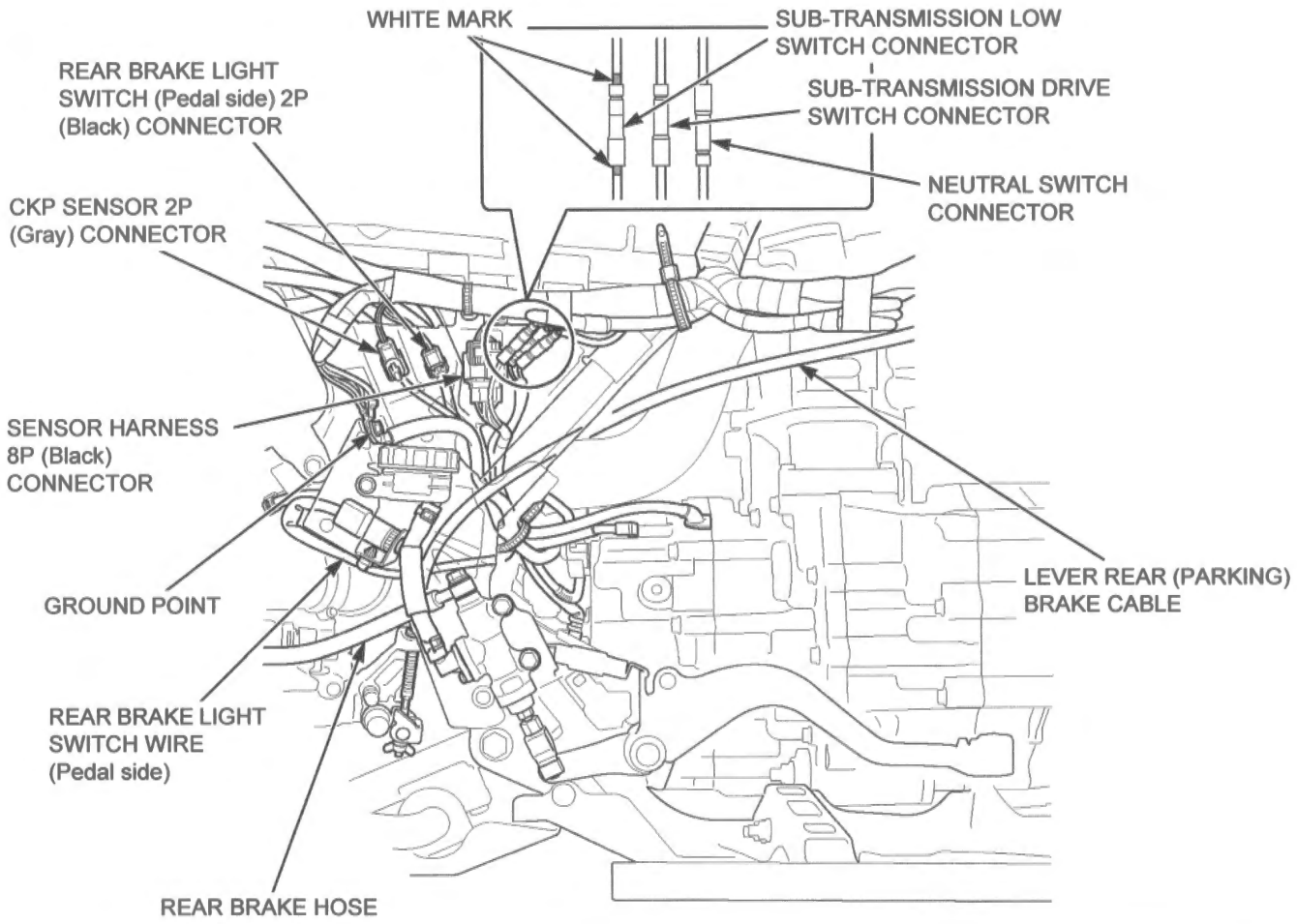
FM5/FM7/FA5/FA6/FA7 ('15 – '19) and FM6 (All):



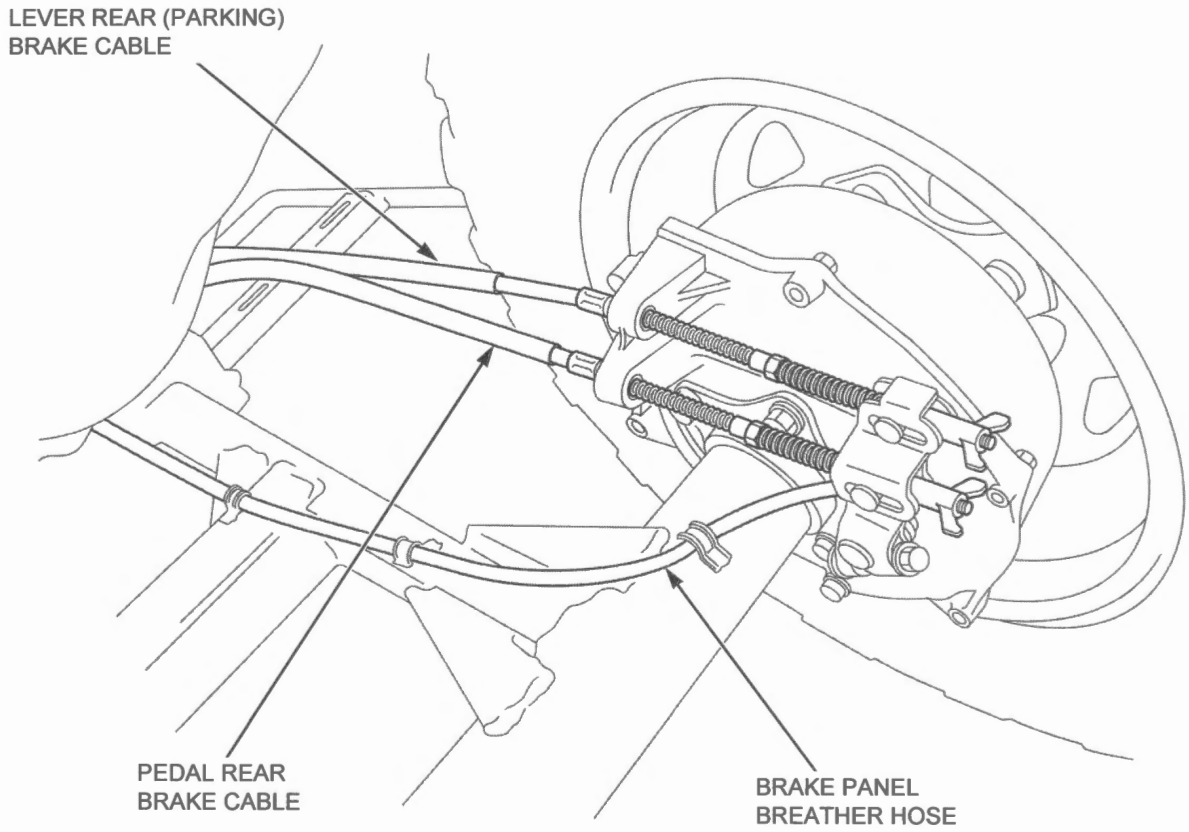
FE2 (After '19):



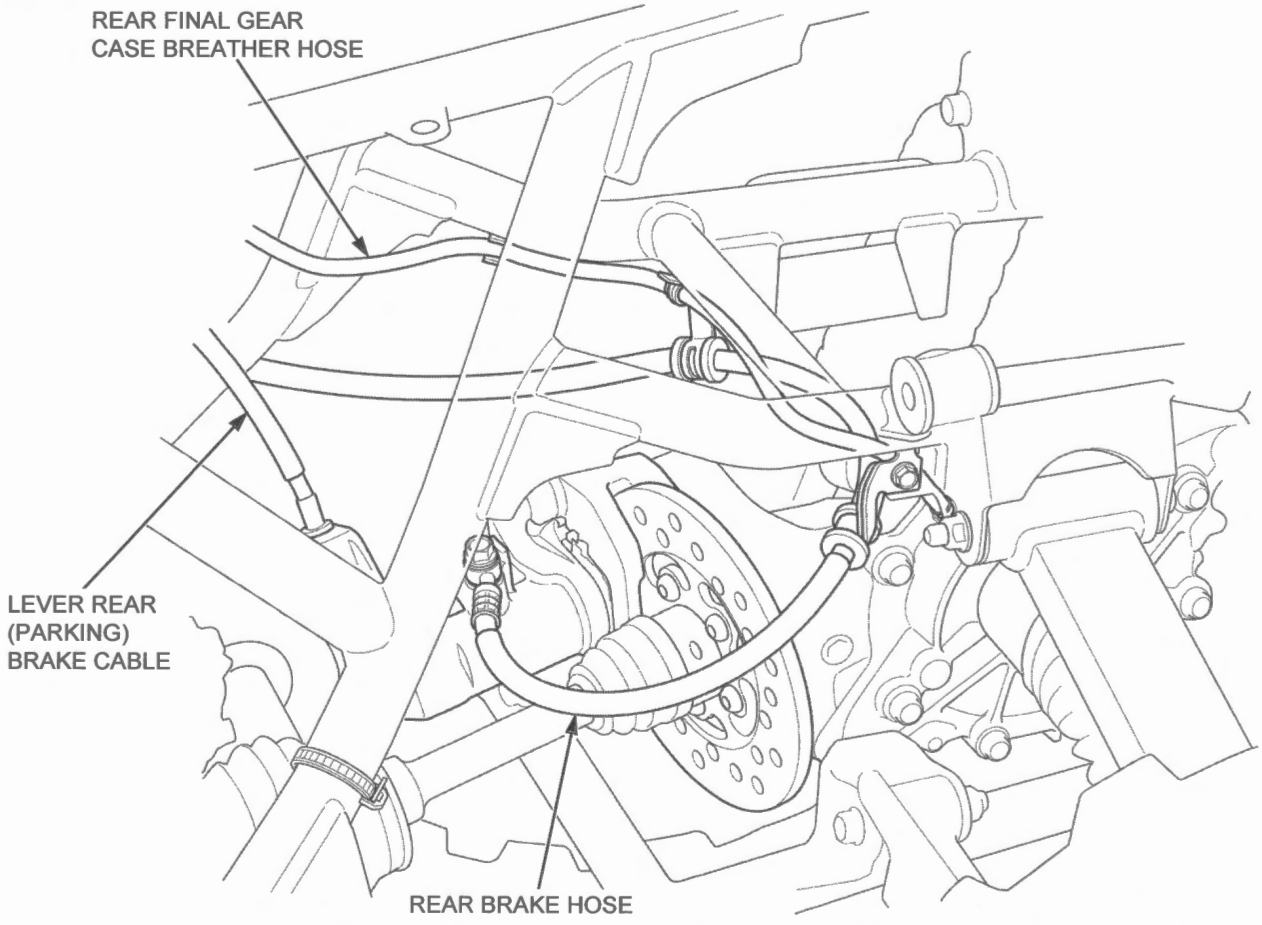
FA5/FA6/FA7 (After '19):



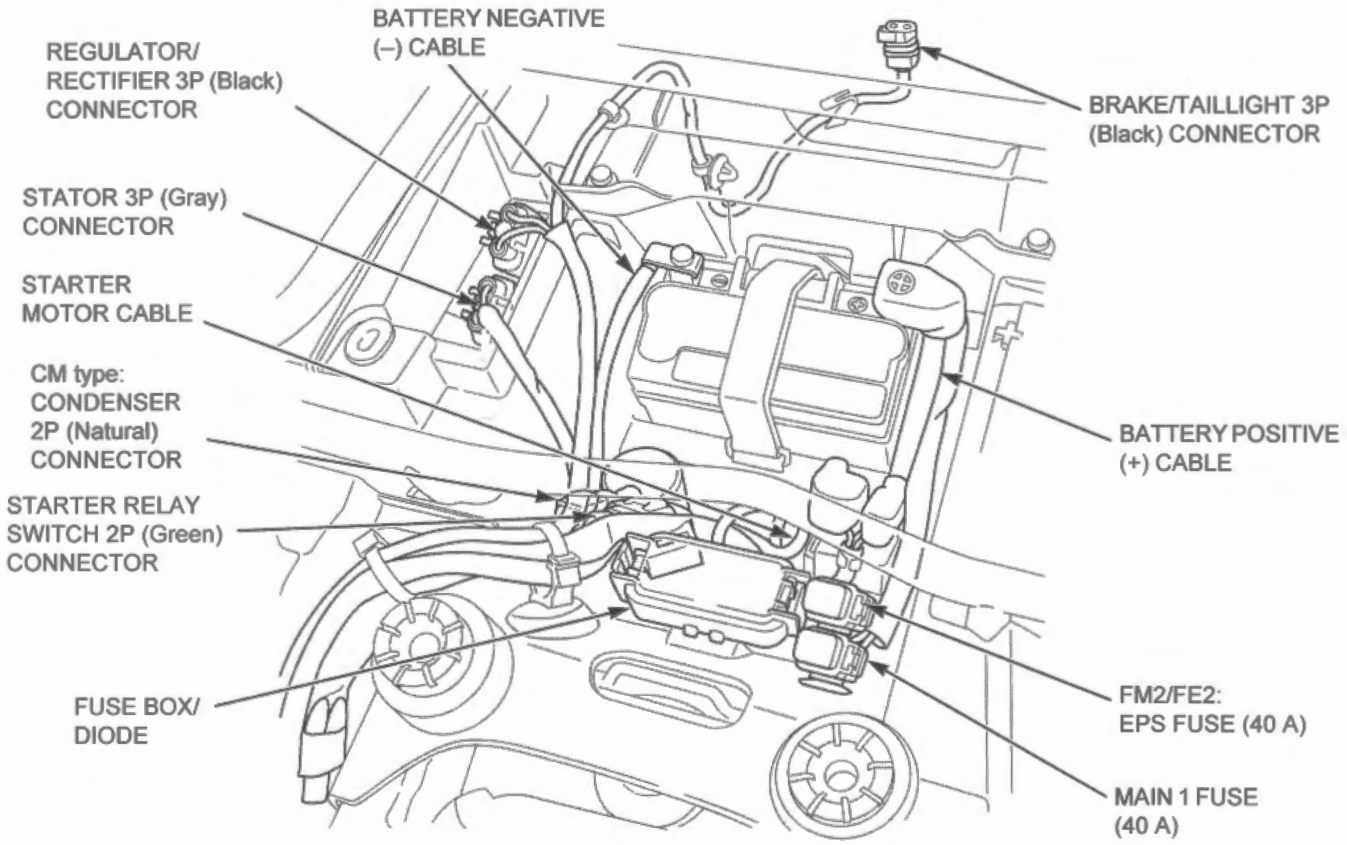
FM1/FM2/FE1/FE2:



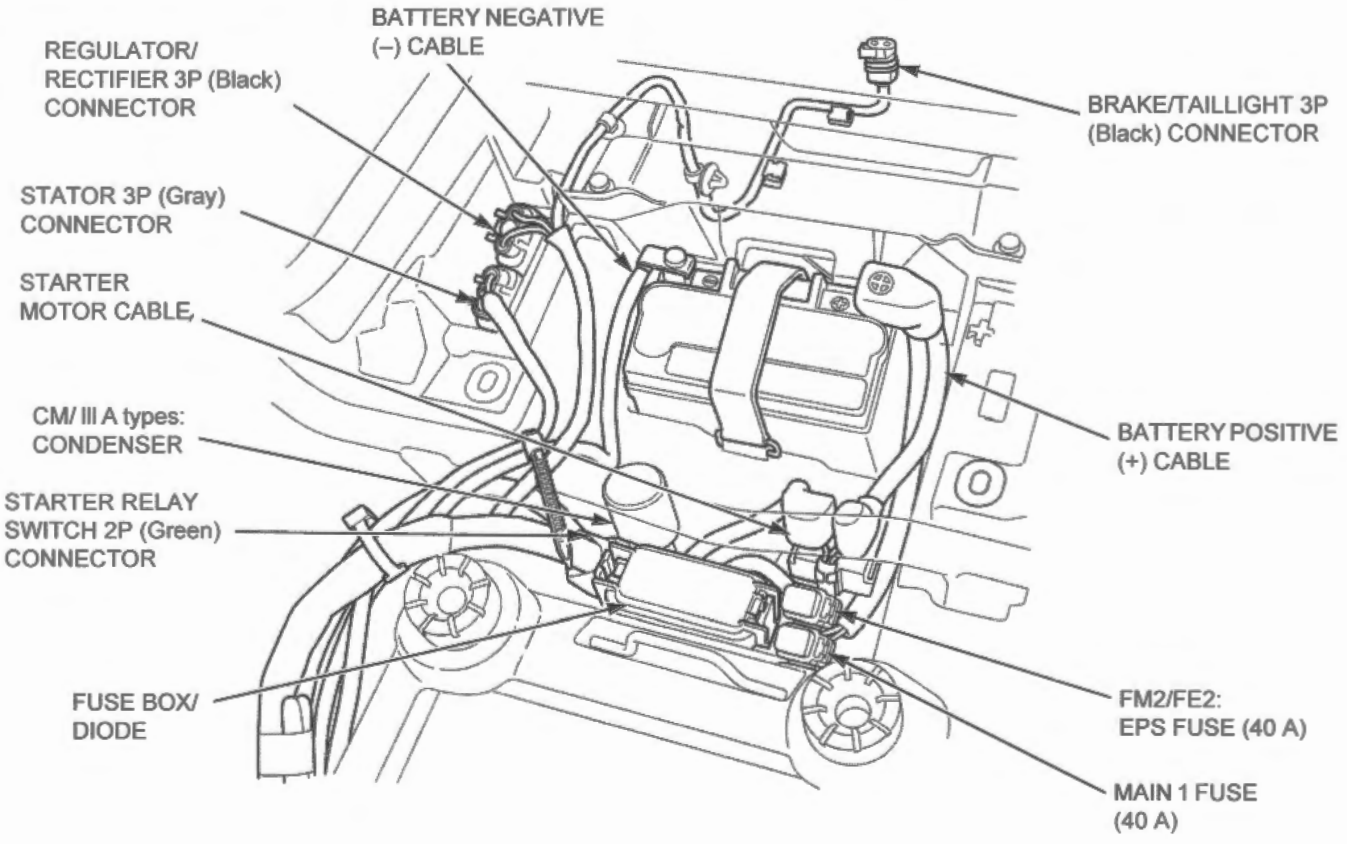
FM5/FM6/FM7/FA5/FA6/FA7:



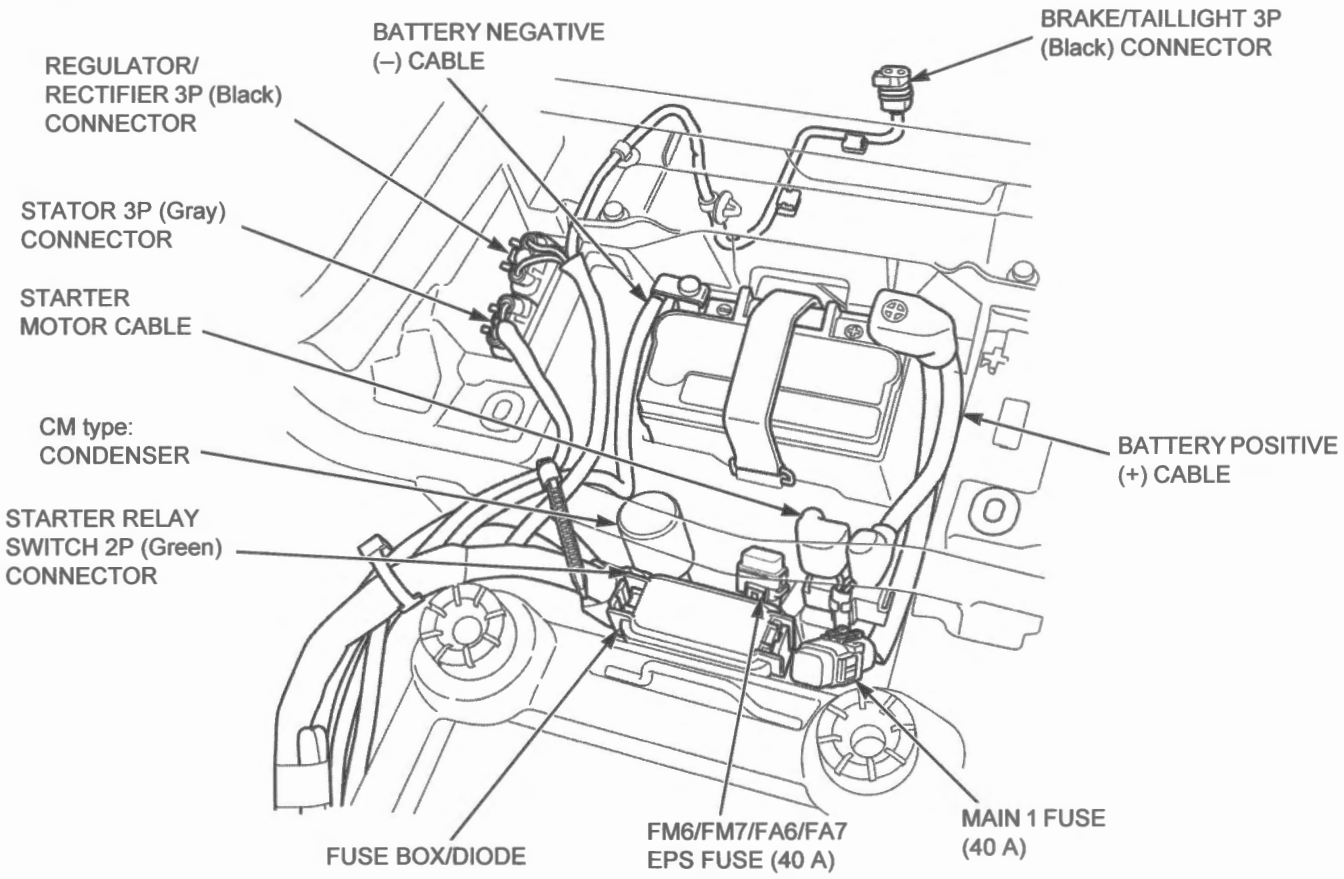
FM1/FM2/FE1/FE2 ('14):



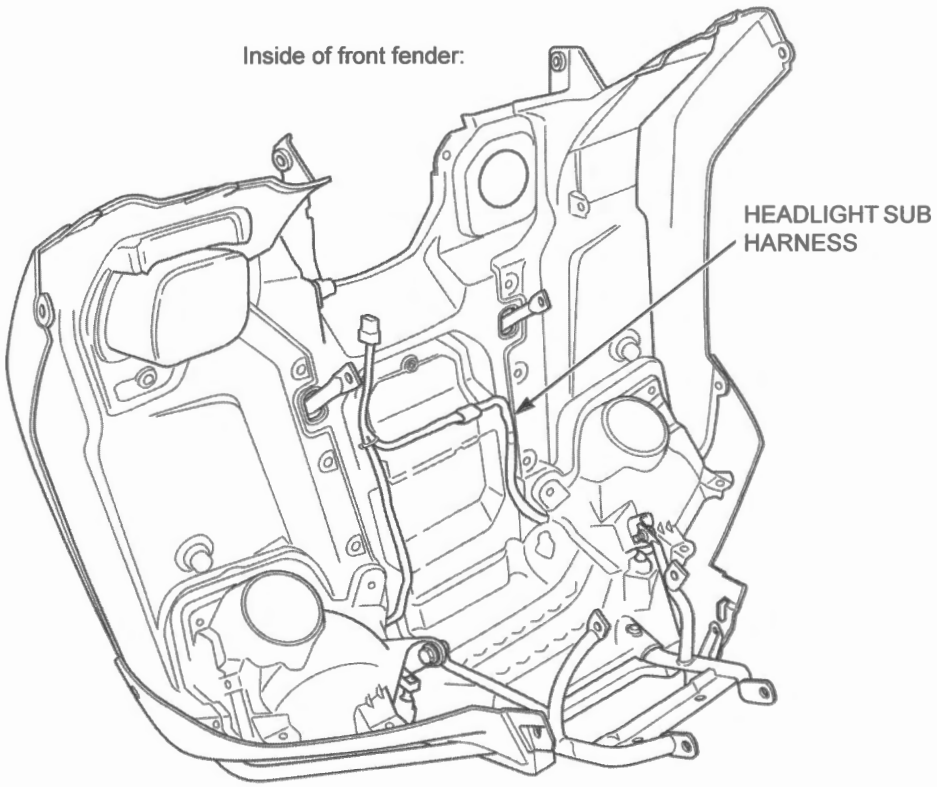
FM1/FM2/FE1/FE2 (After '14):



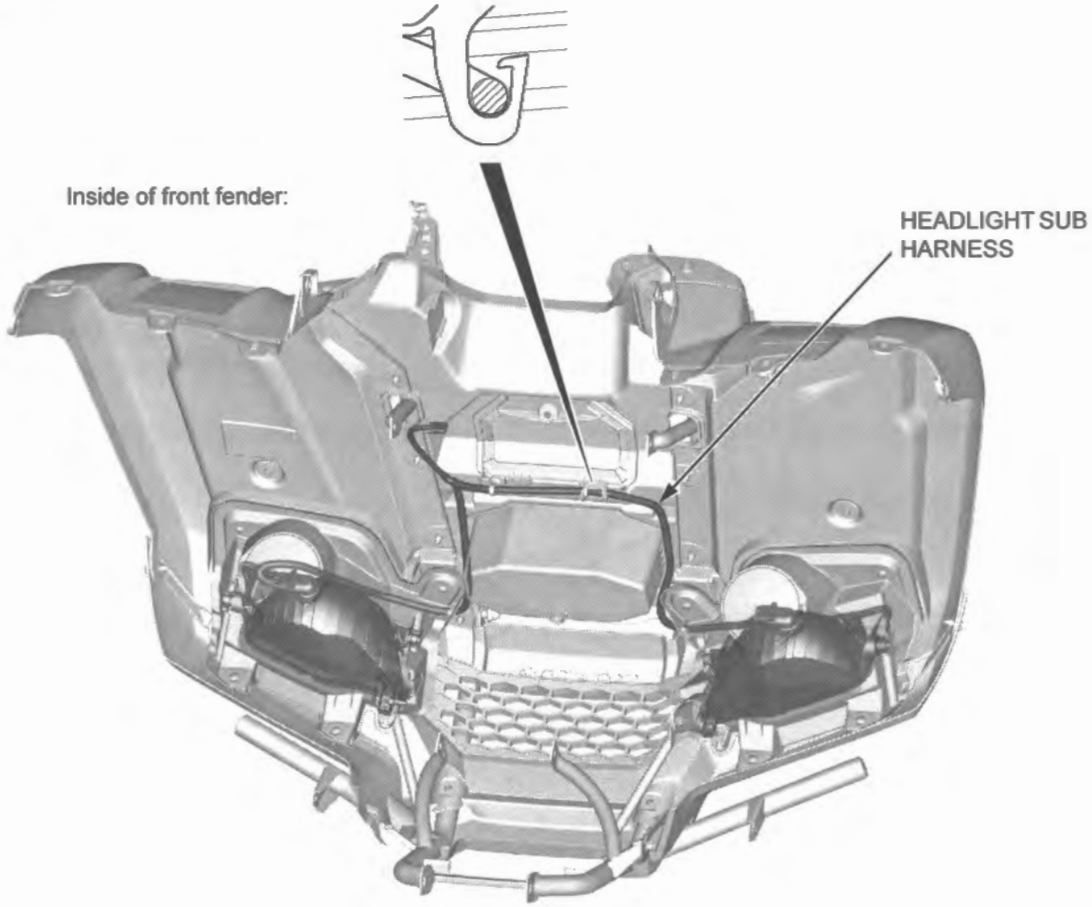
FM5/FM6/FM7/FA5/FA6/FA7:



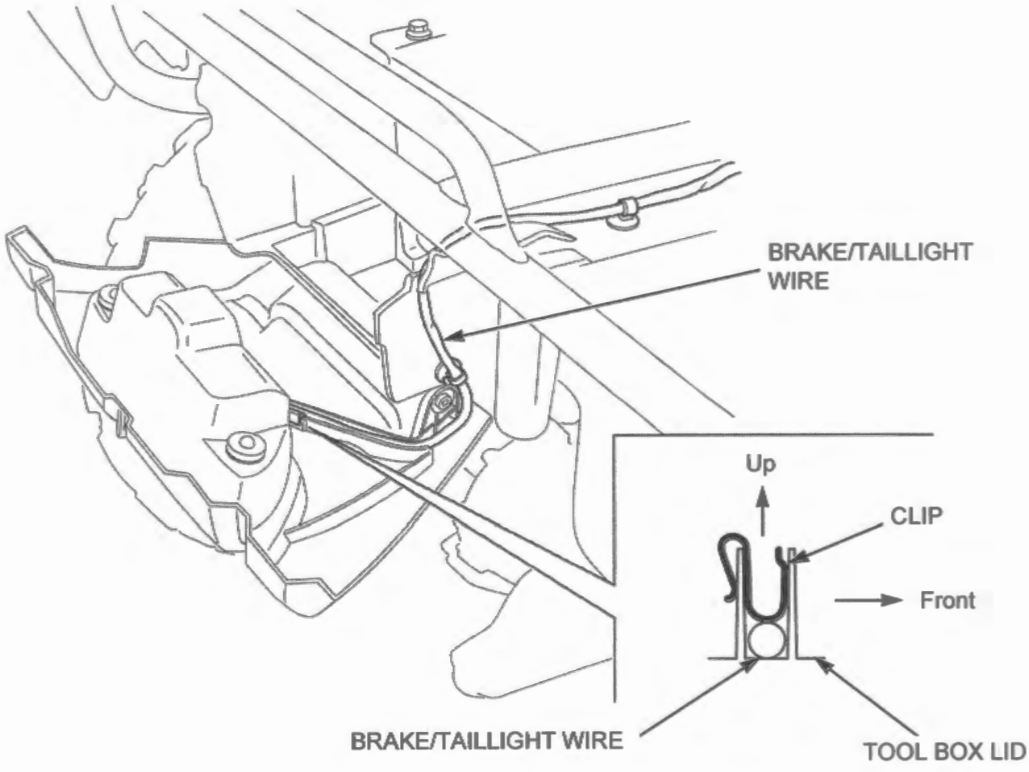
All models ('14 – '19):



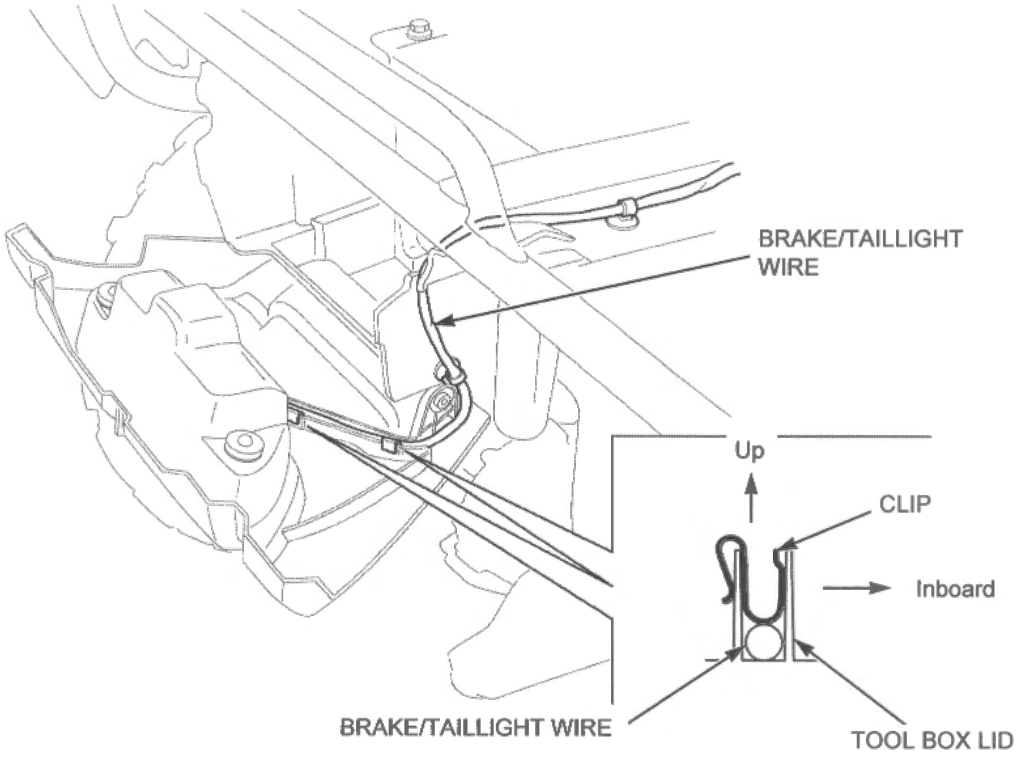
All models (After '19):



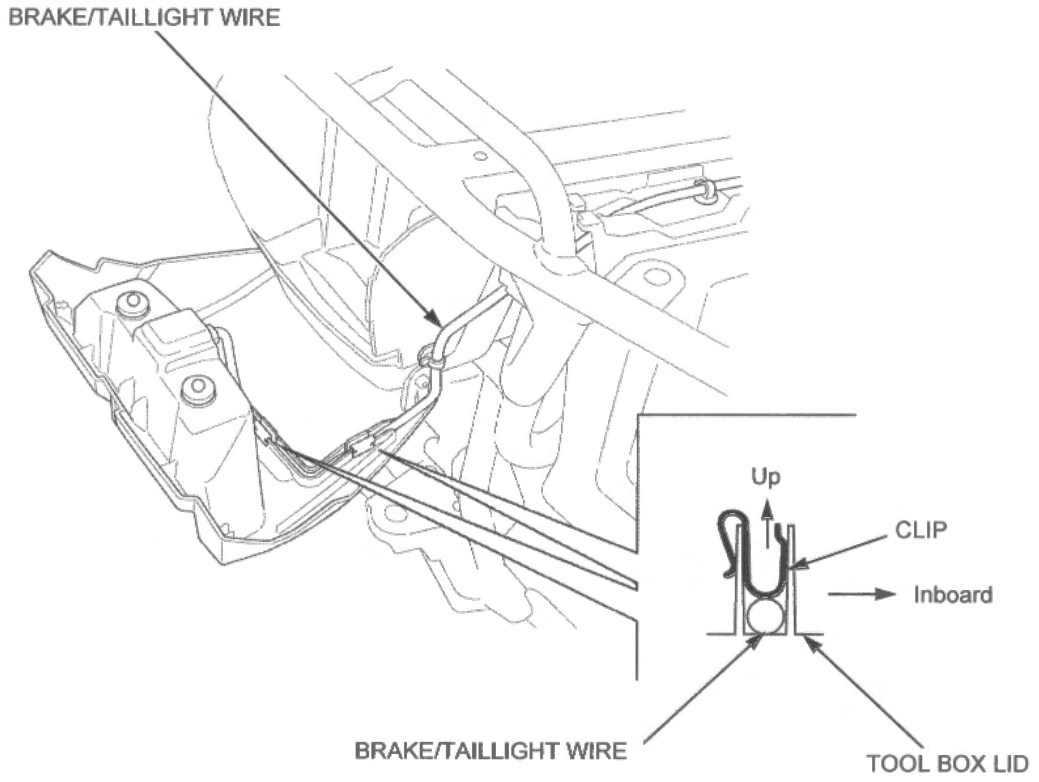
FM1/FM2/FE1/FE2 ('14):



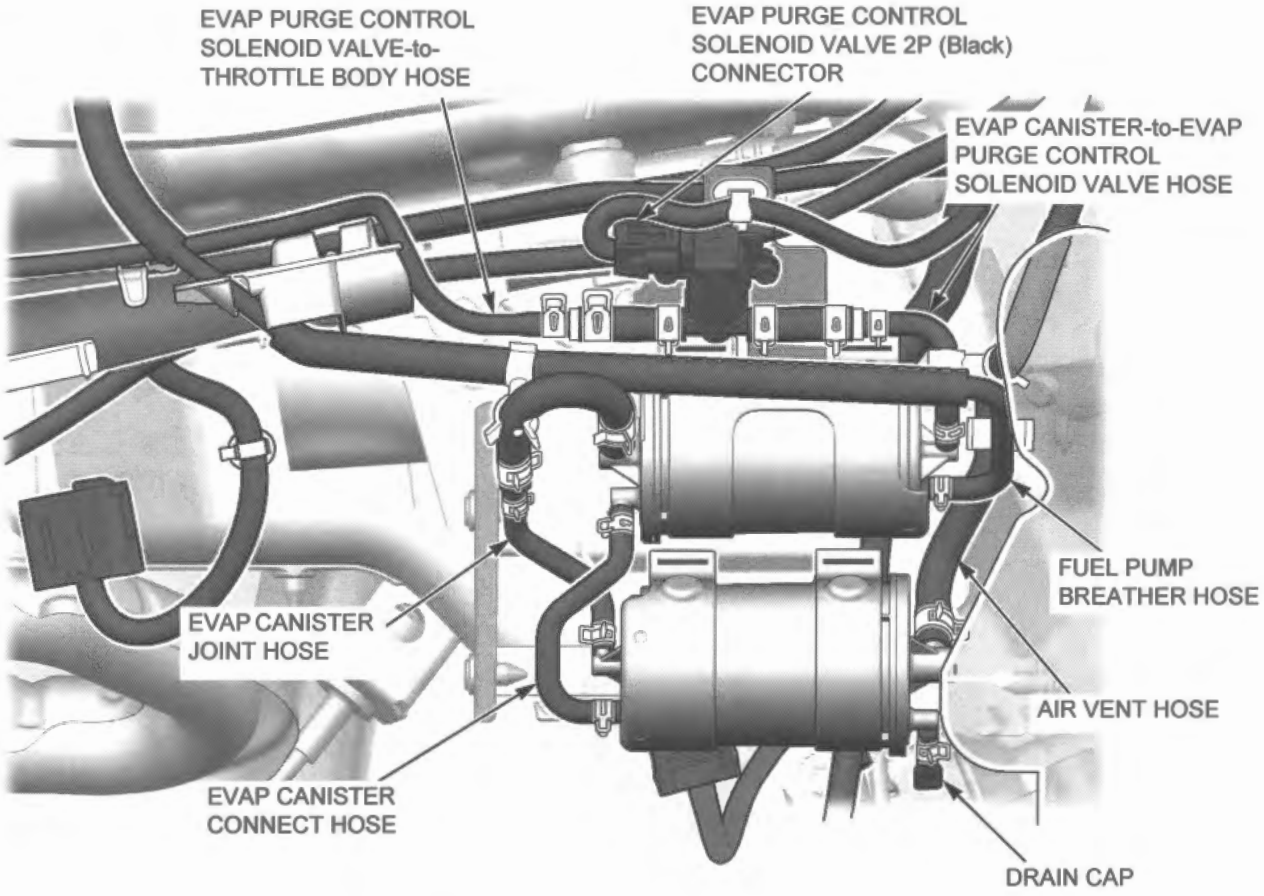
FM1/FM2/FE1/FE2 (After '14):



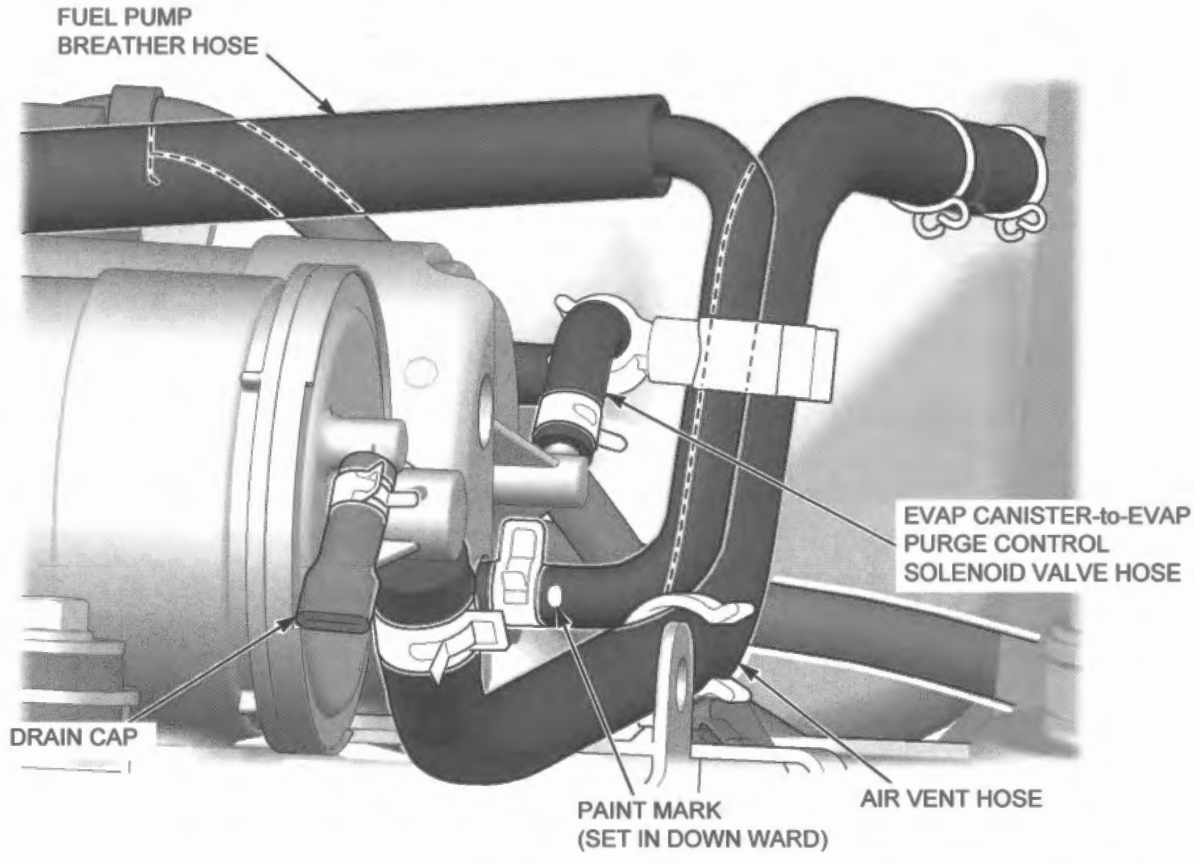
FM5/FM6/FM7/FA5/FA6/FA7:



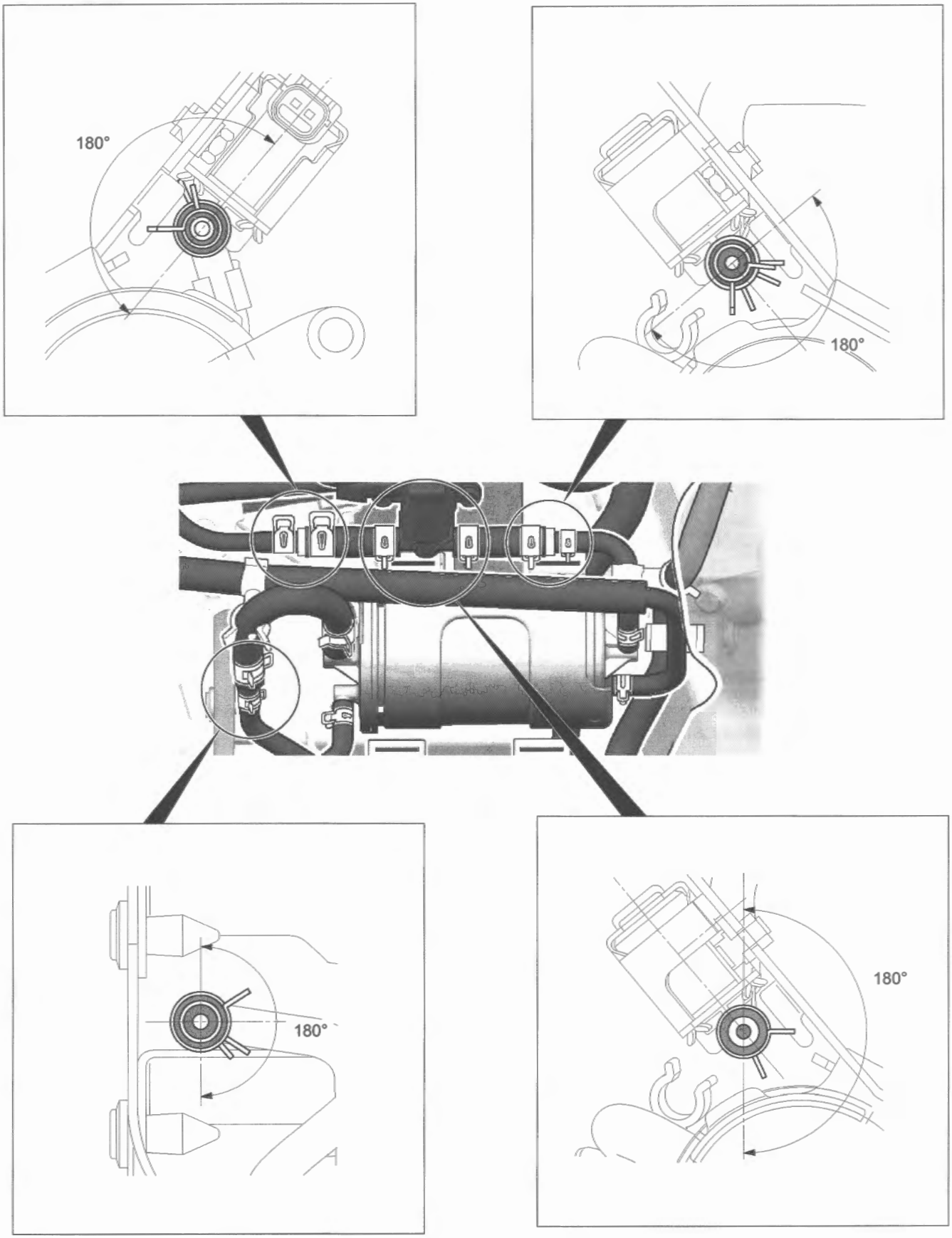
FM1/FM2/FM6/FE2/FA5/FA6/FA7 (AC type: After '19):



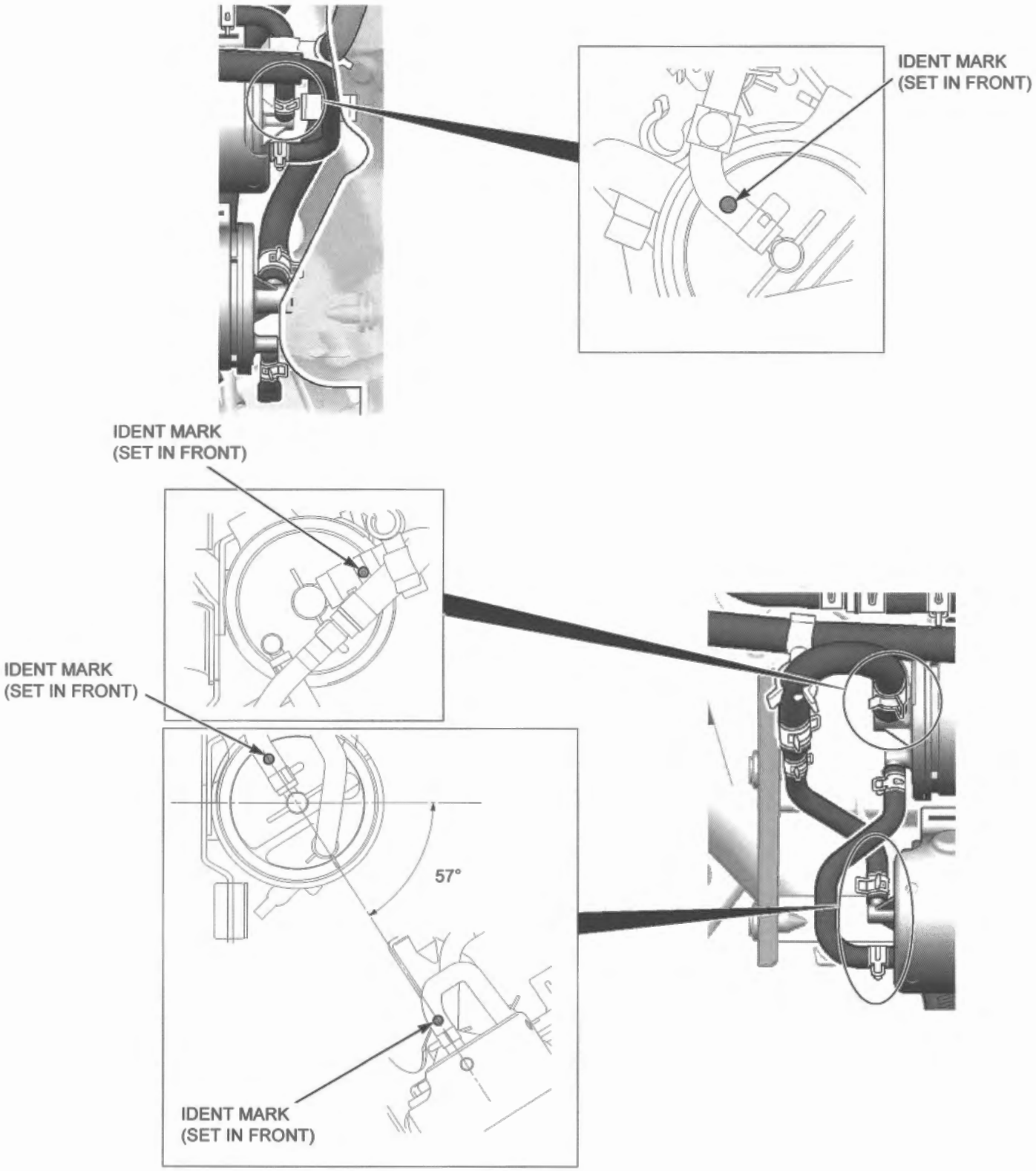
FM1/FM2/FM6/FE2/FA5/FA6/FA7 (AC type: After '19):



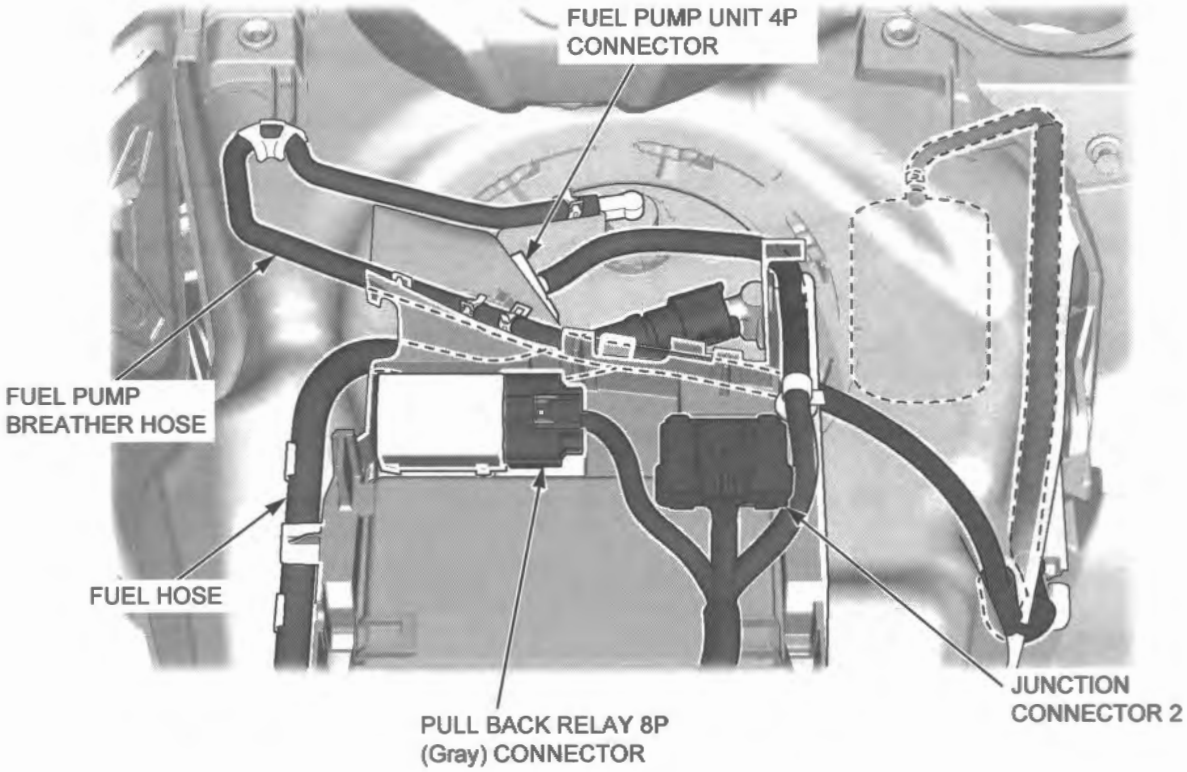
FM1/FM2/FM6/FE2/FA5/FA6/FA7 (AC type: After '19):



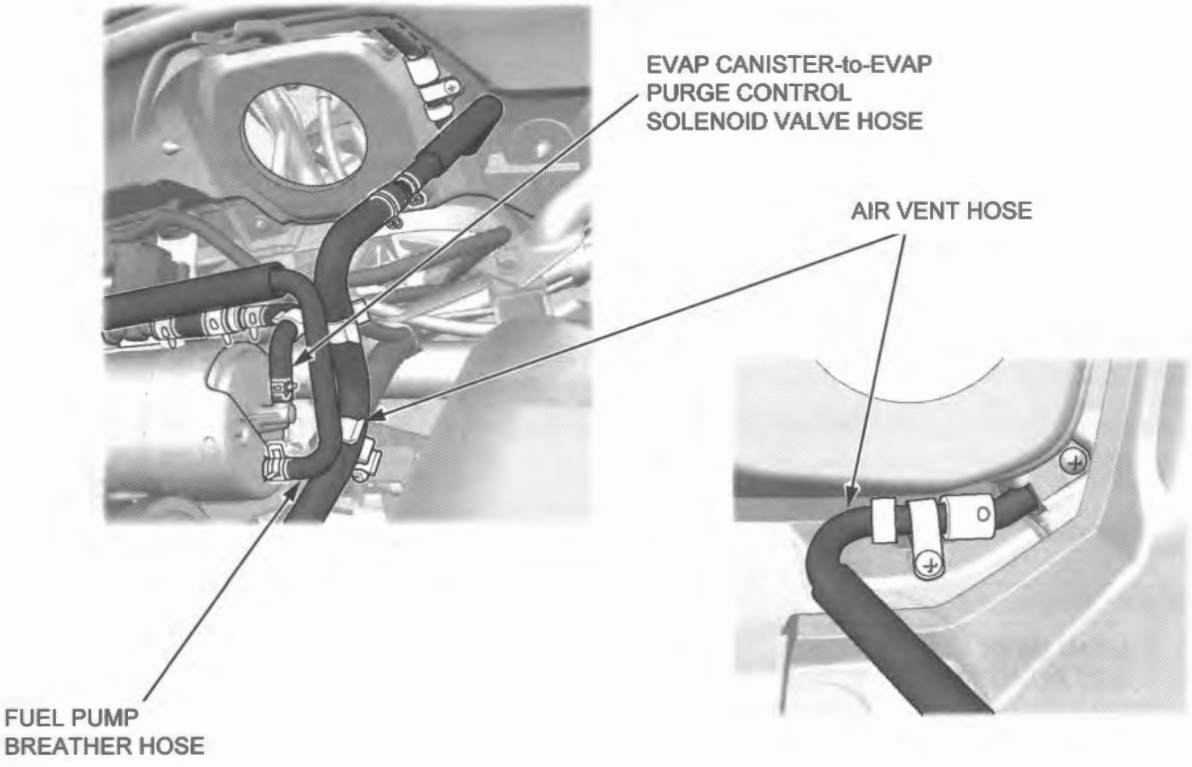
FM1/FM2/FM6/FE2/FA5/FA6/FA7 (AC type: After '19):



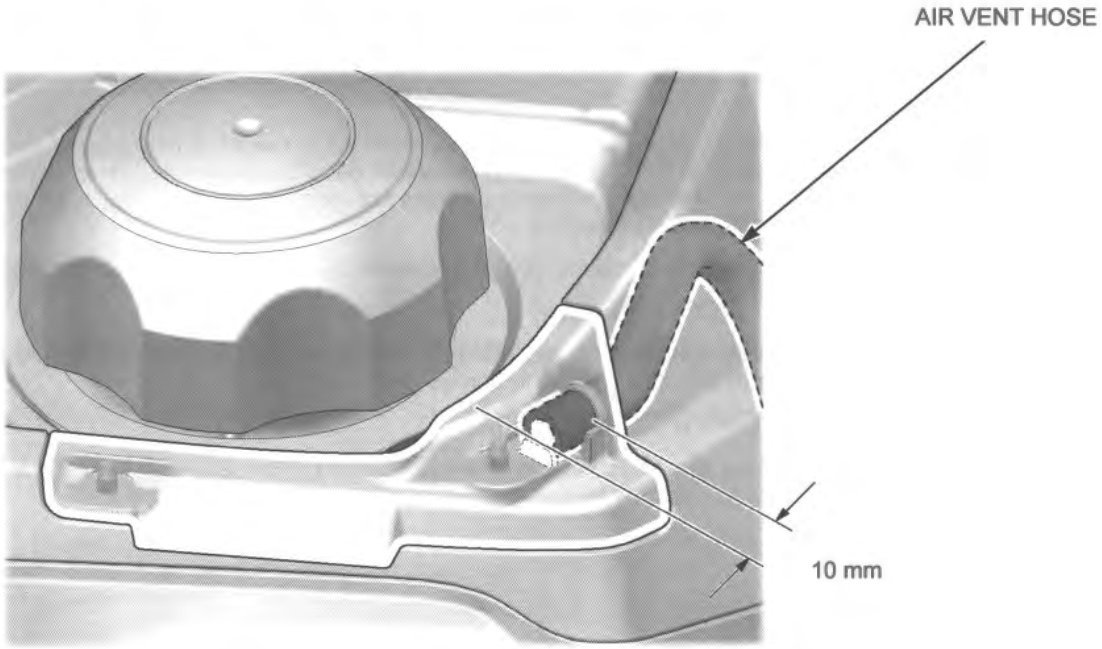
FM1/FM2/FM6/FE2/FA5/FA6/FA7 (AC type: After '19):



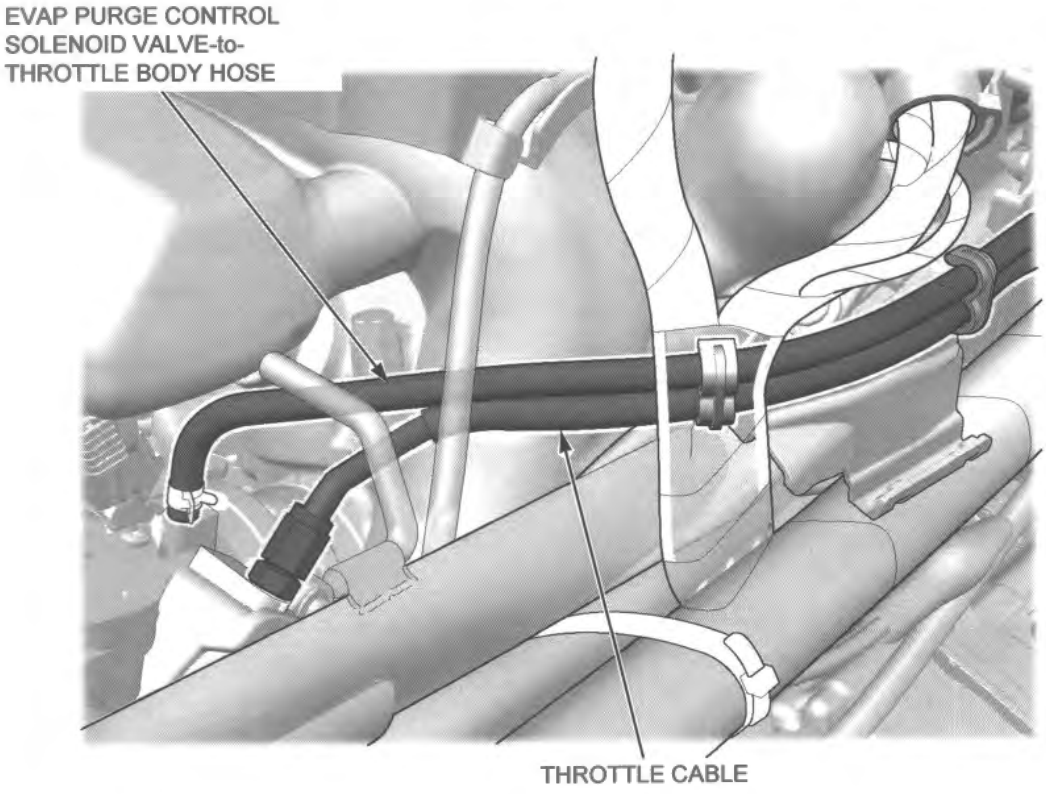
FM1/FM2/FM6/FE2/FA5/FA6/FA7 (AC type: After '19):



FM1/FM2/FM6/FE2/FA5/FA6/FA7 (AC type: After '19):



FM1/FM2/FM6/FE2/FA5/FA6/FA7 (AC type: After '19):



EMISSION CONTROL SYSTEMS

The U.S. Environmental Protection Agency (EPA), the California Air Resources Board (CARB), and Environment Canada (EC) require that off-road ATVs comply with applicable exhaust emissions standards and evaporative emission standards during their useful life, when operated and maintained according to the instructions provided.

SOURCE OF EMISSIONS

Fuel evaporation and the combustion process produces carbon monoxide (CO), oxides of nitrogen (NO_x) and hydrocarbons (HC). The control of hydrocarbons and oxides of nitrogen is very important because, under certain conditions, they react to form photochemical smog when subject to sunlight. Carbon monoxide does not react in the same way, but it is toxic. Uncontrolled fuel evaporation also releases hydrocarbons to the atmosphere.

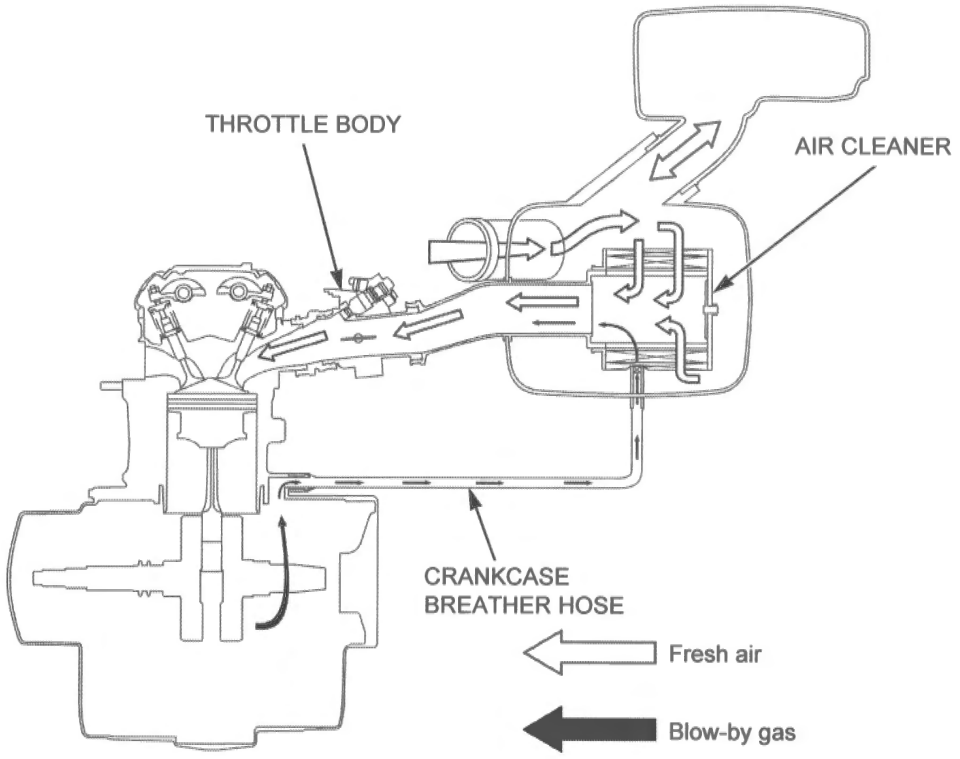
Honda Motor Co., Ltd. utilizes various systems to reduce carbon monoxide, oxides of nitrogen, and hydrocarbons.

EXHAUST EMISSION CONTROL SYSTEM

The exhaust emission control system is composed of the PGM-FI system, and no adjustments should be made. The exhaust emission control system is separate from the crankcase emission control system.

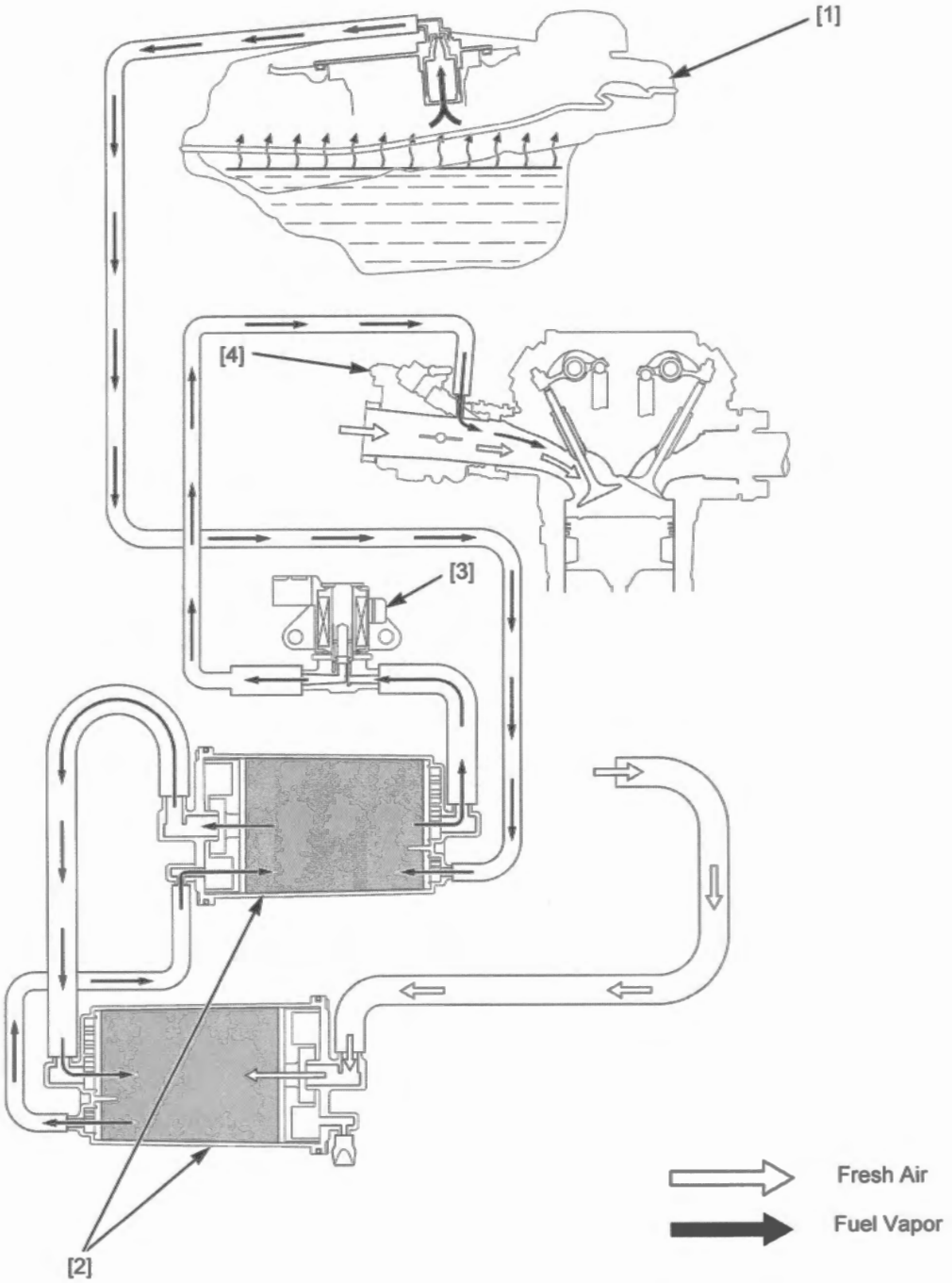
CRANKCASE EMISSION CONTROL SYSTEM

The engine is equipped with a closed crankcase system to prevent discharging crankcase emissions into the atmosphere. Blow-by gas is returned to the combustion chamber through the air cleaner and throttle body.



EVAPORATIVE EMISSION CONTROL SYSTEM (After '19 AC type)

This model complies with California Air Resources Board (CARB) evaporative emission requirements.Fuel vapor from the fuel tank [1] is routed into the EVAP canister [2] where is it absorbed and stored while the engine is stopped. When the engine is running and the EVAP purge control solenoid valve [3] is open, fuel vapor in the EVAP canister is drawn into the engine through the throttle body [4].



SERVICING THE HONDA

U.S.A. Only

Maintenance, replacement or repair of the emission control devices and systems may be performed by any ATV repair establishment or individual using parts that are "certified" to EPA standards.

PROHIBITED ACTIONS

The following prohibitions apply to everyone with respect to the engine's emission control system.

You may not remove or disable any device or element of design that may affect an engine's emission levels. This restriction applies before and after the engine is placed is service.

NOISE EMISSION CONTROL SYSTEM

TAMPERING WITH THE NOISE EMISSION CONTROL SYSTEM IS PROHIBITED: U.S. Federal law prohibits, or Canadian provincial law may prohibit the following acts or the causing thereof: (1) The removal or rendering inoperative by any person, other than for purposes of maintenance, repair or replacement, of any device or element of design incorporated into any vehicle for the purpose of noise control prior to its sale or delivery to the ultimate customer or while it is in use; or (2) the use of the vehicle after such device or element of design has been removed or rendered inoperative by any person.

AMONG THOSE ACTS PRESUMED TO CONSTITUTE TAMPERING ARE THE FOLLOWING ACTS:

1. Removal of, or puncturing the muffler, baffles, header pipes or any other component which conducts exhaust gases.
2. Removal of, or puncturing of any part of the intake system.
3. Lack of proper maintenance.
4. Removing or disabling any emissions compliance component, or replacing any compliance component with a non-compliant component.

FUEL PERMEATION EMISSION CONTROL SYSTEM

This ATV complies with the Fuel Permeation Emission Control regulations of the U.S. Environmental Protection Agency (EPA), the California Air Resource Board (CARB) and Environment Canada. The fuel tank, fuel hoses, and fuel vapor charge hoses used on this ATV incorporate fuel permeation control technologies. Tampering with the fuel tank, fuel hoses, or fuel vapor charge hoses to reduce or defeat the effectiveness of the fuel permeation technologies is prohibited by federal regulations.

REBUILT ENGINE

When you rebuild the engine including a major overhaul in which you replace the engine's pistons or power assemblies or make other changes that significantly increase the service life of the engine, the vehicle will continue to comply with all emissions regulations if you:

- Make sure you are technically qualified to rebuild the engine and have the proper tools
- Diagnose and respond to all Diagnostic Trouble Codes (DTC), and erase all DTCs after addressing their cause
- Use only Honda Genuine parts or equivalents
- Make sure to maintain all specifications as described in this Service Manual

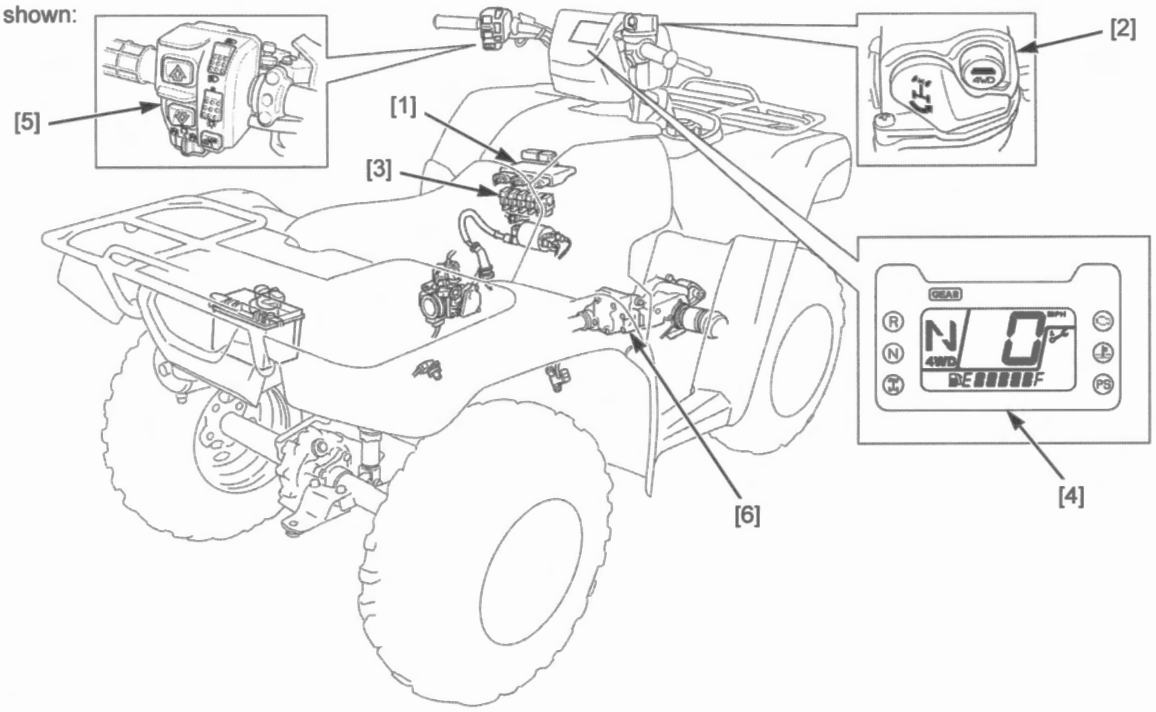
TECHNICAL FEATURES

DIFFERENTIAL LOCK SYSTEM

DESCRIPTION

The differential lock system allows the ATV rider to lock the front differential electrically. Together with the front final clutch, the system provides three drive modes: 2WD, 4WD, and 4WD with the front differential locked. Pushing or sliding switches on the handlebar operates the system. The components listed below comprise the differential lock system.

'14 model shown:

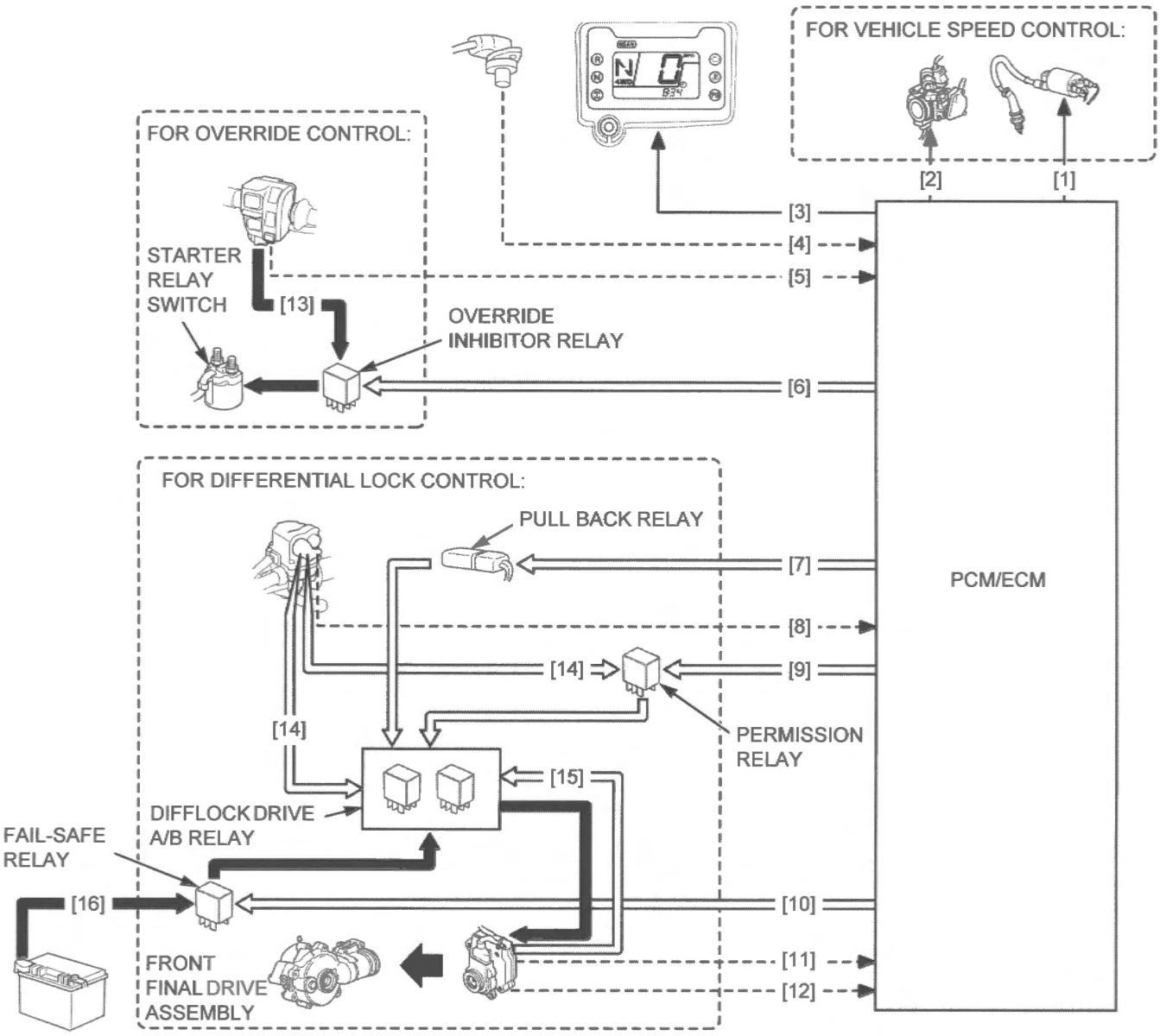


- **PCM/ECM** [1]: The PCM/ECM controls the differential lock and 4WD indicators as well as relays, ignition, and fuel injection. It does this through inputs from the actuator rotary switch, right and left handlebar switches, the VS sensor and the CKP sensor.
- **RIGHT HANDLEBAR SWITCH** [2] (4WD and Differential lock switches): When the 4WD or differential lock switches are operated, relays are turned ON/OFF causing the system circuit and rotating direction of the actuator motor to be changed.
- **RELAYS** [3] (The system circuit includes the following relays):
  - Difflock fail-safe relay: Shuts down the power for the differential lock system for the PCM/ECM when a failure occurs.
  - Permission/Pull back relays: When sent signals from the PCM/ECM it shifts the system from 4WD to 4WD with differential lock and visa versa.
  - Difflock drive A/B relays: Changes the actuator motor rotation when directed by the difflock actuator and the right handlebar switch operation.
  - Override inhibitor relay: Controls the starter motor circuit override mode with signals from the PCM/ECM.
- **COMBINATION METER** [4]: The combination meter indicates "DL" and "4WD" according to signals from the PCM/ECM.
- **LEFT HANDLEBAR SWITCH** [5] (STARTER/OVERRIDE SWITCH): The drive mode is shifted to override mode when the starter/override switch is operated while the system is in differential lock mode.
- **FRONT FINAL DRIVE ASSEMBLY** [6]:
  - The front final drive assembly consists of the following electrical and mechanical parts:

Electrical parts	For electrical control	Difflock Actuator	The actuator integrates a rotary switch for the shifting system circuit and the actuator motor for the shifting driving mechanism. Do not disassemble the difflock actuator assembly.
Mechanical parts	For drive mode selection	Screw Shaft	The screw shaft transmits actuator rotation to the final clutch sleeve and difflock sleeve. By moving the sleeves, the drive mode is changed.
	For 2WD-4WD system	Final Clutch Sleeve/ Joint, Pinion Gear	The final clutch sleeve brings the final clutch joint into contact with the pinion gear. When they are in contact the engine power is transmitted to the front differential and the drive mode is changed to 4WD mode.
	For differential lock system	Difflock Cam	The difflock cam rotates via the rotation of a screw shaft. The difflock is mechanically engaged or disengaged by the cams grooves.
		Difflock Fork	The difflock fork moves when its pin and the cam grooves are in contact.
		Difflock Sleeve, Face Cam A and Differential	The difflock sleeve has three bosses. When the sleeve is moved by the screw shaft, difflock cam, and fork, the bosses insert into the holes of the face cam A, which locks the differential.

CONTROL CIRCUIT

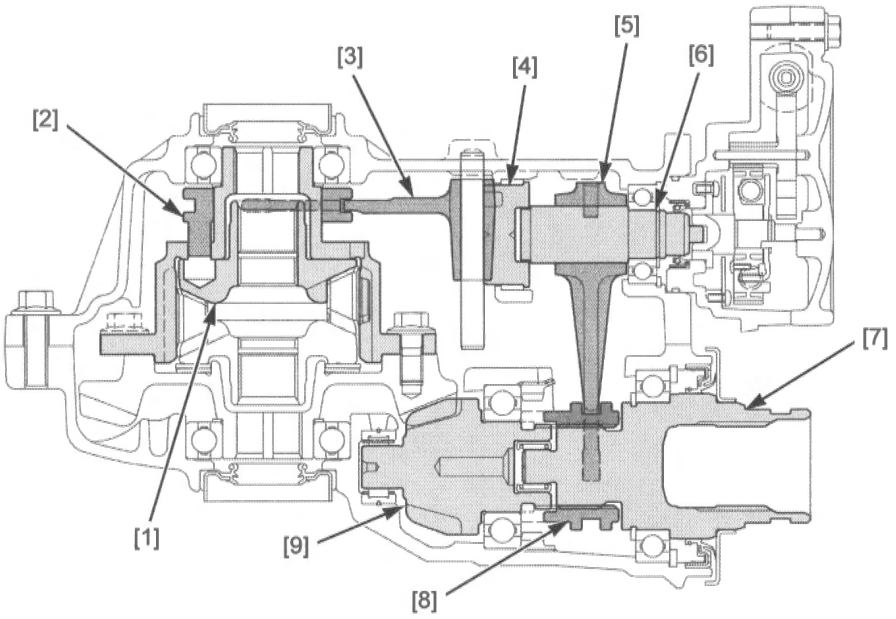
The PCM/ECM receives signals from various sensors and switches. With this information, it determines and controls the correct operation of the relays and actuator motors to change the drive mode.
See the list of system components below.



[1] IGNITION SIGNAL OUTPUT
[2] FUEL INJECTION SIGNAL OUTPUT
[3] 4WD/DIFFERENTIAL LOCK INDICATOR OUTPUT
[4] VEHICLE SPEED PULSE INPUT
[5] STARTER/OVERRIDE SWITCH SIGNAL INPUT
[6] OVERRIDE INHIBITOR RELAY ACTUATE OUTPUT
[7] PULL BACK RELAY DRIVE OUTPUT
[8] DIFFERENTIAL LOCK SWITCH SIGNAL INPUT
[9] PERMISSION RELAY DRIVE OUTPUT
[10] FAIL-SAFE RELAY DRIVE OUTPUT
[11] DIFFLOCK SWITCH SIGNAL INPUT
[12] DIFFLOCK MOTOR VOLTAGE INPUT
[13] STARTER/OVERRIDE SWITCH SIGNAL OUTPUT
[14] DIFFERENTIAL LOCK SWITCH SIGNAL OUTPUT
[15] ACTUATOR SWITCH SIGNAL OUTPUT
[16] POWER SUPPLY FOR DRIVING ACTUATOR MOTOR

MECHANICAL SYSTEM

This system includes the driving mechanisms shown below:



[1] FACE CAM A
[2] DIFFLOCK SLEEVE
[3] DIFFLOCK FORK
[4] DIFFLOCK CAM
[5] FINAL CLUTCH FORK
[6] SCREW SHAFT
[7] FINAL CLUTCH JOINT
[8] FINAL CLUTCH SLEEVE
[9] PINION GEAR

SYSTEM OPERATION

FRONT FINAL DRIVE OPERATION

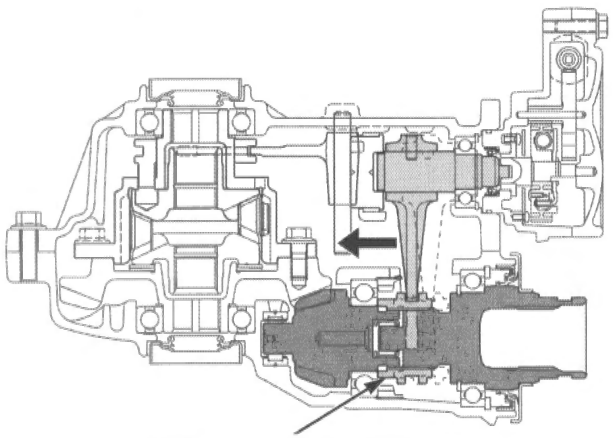
When the drive mode is shifted from 2WD to 4WD:



Push

4WD Stays on

(When the shifting procedure is completed)



FINAL CLUTCH SLEEVE:
Engine power is transmitted to the pinion gear.

When the drive mode is shifted from 4WD to Difflock:

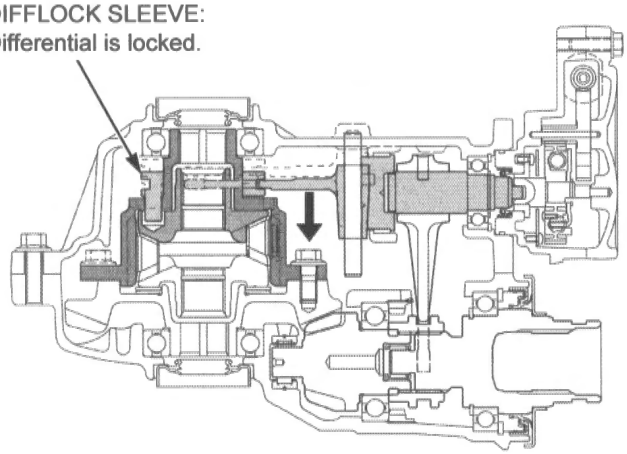


Slide

Stay on

(When the shifting procedure is completed)

DIFFLOCK SLEEVE:
Differential is locked.



Slow flash

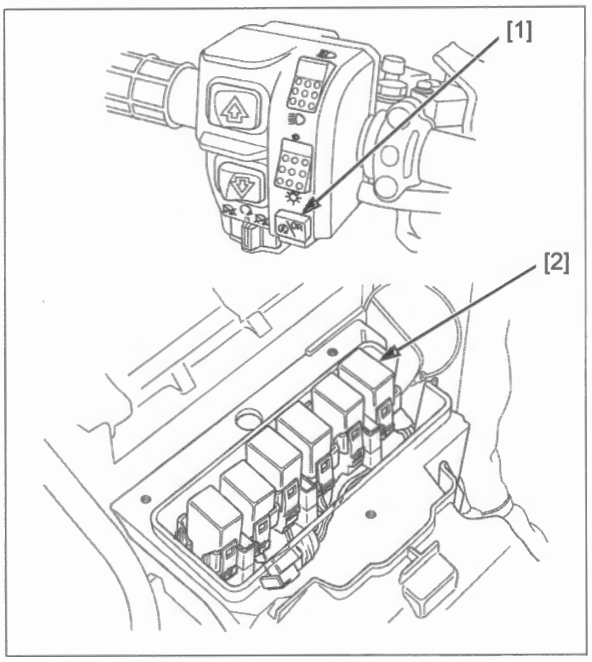
When the vehicle speed is 10 mph or below during the shifting process, the drive mode will be shifted to differential lock.

Fast flash

When the vehicle speed is above 10 mph during the shifting process, the drive mode is not shifted to differential lock.

OVERRIDE SYSTEM

The override system consists of the PCM/ECM, starter/override switch [1], and override inhibitor relay [2]. Pushing the starter/override switch when in differential lock mode, sends an override signal to the PCM/ECM.
The override mode boosts the vehicle speed limit from 20 mph to 40 mph when in differential lock mode (while the starter/override switch is pushed).

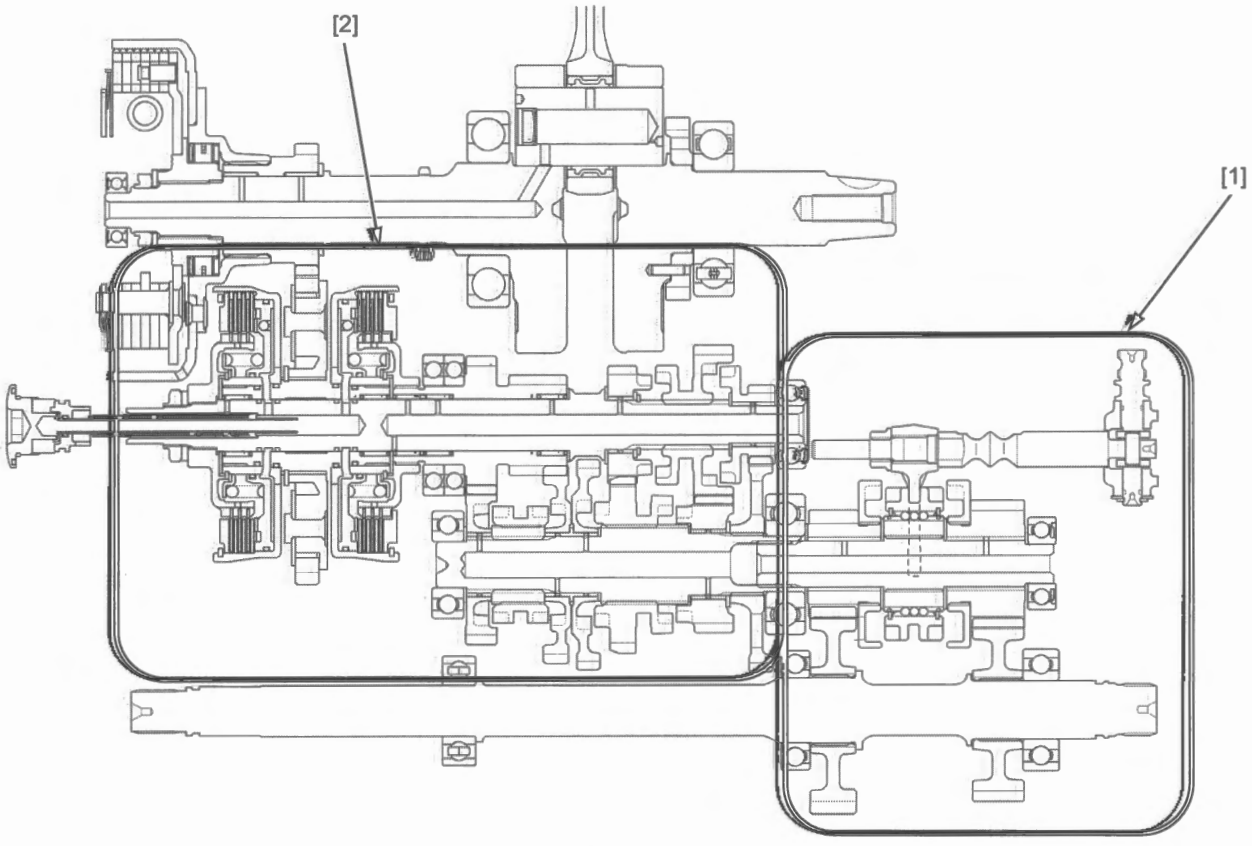


TROUBLESHOOTING

- In the differential lock system, DTCs are set in the PCM/ECM. See DIFFERENTIAL LOCK SYSTEM TROUBLESHOOTING INFORMATION (page 21-11).
- If the differential lock indicator does not stay on when the differential lock mode is selected, turn the handlebar left and right, lock to lock. While the differential lock indicator is still flashing, move the ATV slowly while steering the handlebar all the way to right or left.

SUB-TRANSMISSION COMBINED WITH DCT (FA models)

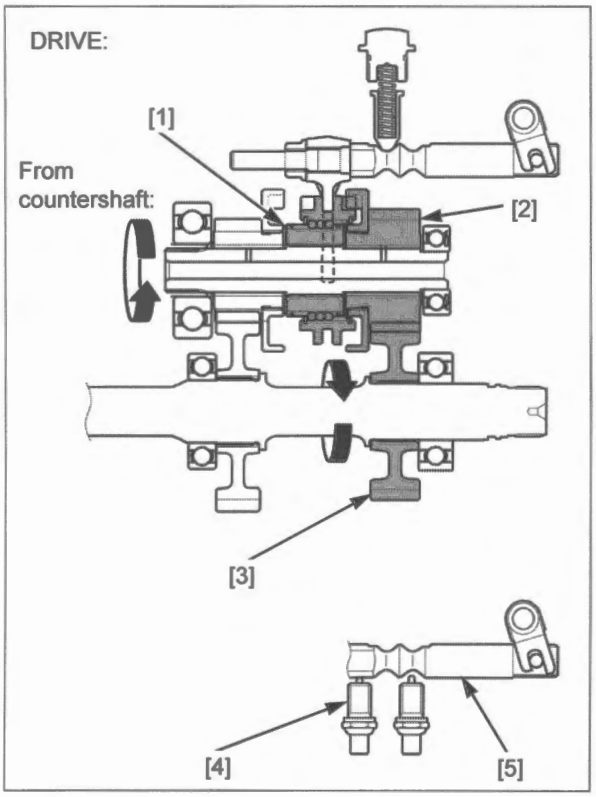
This model utilizes a sub-transmission system [1] combined with DCT [2], which allows the user to select DRIVE range and LOW range, providing more versatile use.
The sub-transmission is located at the rear of the engine, directly connected to the countershaft.



The sub-transmission can be shifted with the range select lever when the vehicle is stationary.

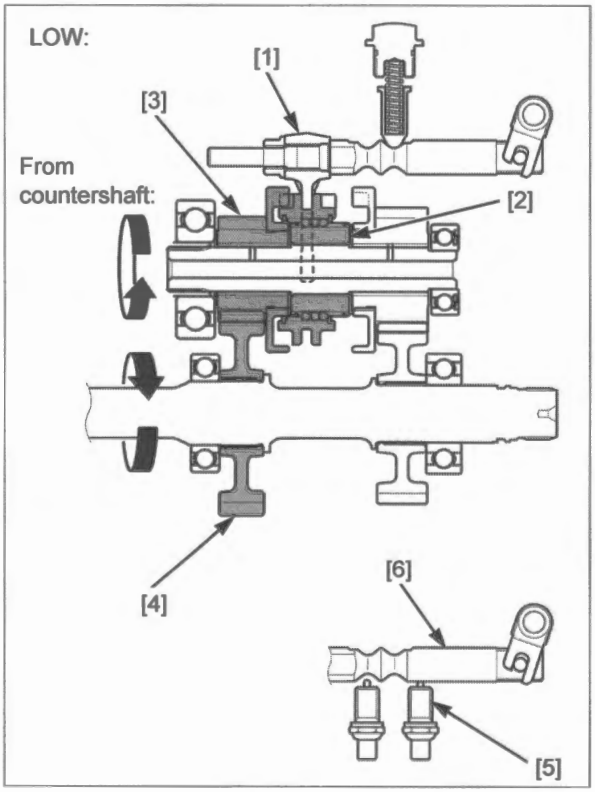
DRIVE MODE:

When the lever is in drive position, the dogs of the shifter [1] are engaged with sub-transmission high gear [2], which turns the final driven high gear [3].
In this position, sub-transmission drive switch [4] is in contact with shift fork shaft [5].
According to the signal from the drive switch, the PCM selects the DCT shift schedule for Drive mode.



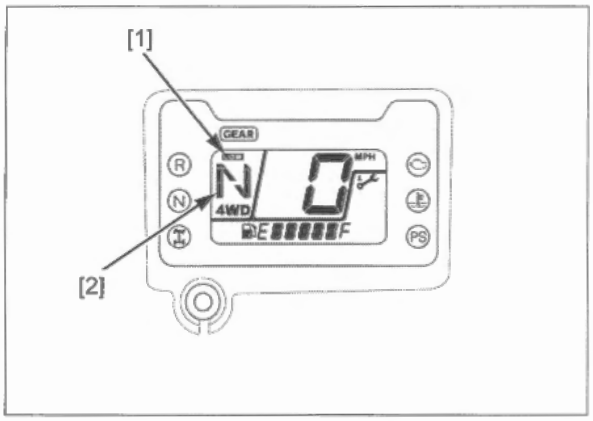
LOW MODE:

When the lever is shifted into Low position, the shift fork [1] slides the shifter [2] toward the sub-transmission low gear [3], which turns the final driven low gear [4] to obtain the lower gear ratio.
In this position, sub-transmission low switch [5] is in contact with shift fork shaft [6].
According to the signal from the low switch, the PCM selects the DCT shift schedule for Low mode.



INDICATOR OPERATION:

When the Low range is selected, Low indicator [1] comes ON and current gear position is also indicated in the LCD.
When the sub-transmission range is not detected by the PCM, the gear position indicator [2] indicates "-" and the DCT system stops shifting.
In case there is a failure in the system, the gear position indicator "-" indicates the DTC by the number of blinks (page 13-17).



SUB-TRANSMISSION			CONTROLS	VEHICLE STATUS
RANGE	Low switch	Drive switch		
Low range	ON	OFF	PCM selects Low range shift schedule.	Normal operation
Drive range	OFF	ON	PCM selects Drive range shift schedule.	Normal operation
Not detected by PCM	OFF	OFF	PCM maintains previously chosen shift schedule. DCT shifting between 1st through 5th does not operate. (Shifting between 1st, neutral and reverse is possible.)	DCT actuators shut down. (Dual clutch PC solenoid valve/Shift solenoid valve/Shift control motor) Shifting between 1st through 5th does not operate. (Shifting between 1st, neutral and reverse is possible.)
Failure	ON	ON	Drivetrain failure	DCT actuators shut down. (Dual clutch PC solenoid valve/Shift solenoid valve/Shift control motor.)

2. FRAME/BODY PANELS/EXHAUST SYSTEM

SERVICE INFORMATION 2-2
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EXHAUST SYSTEM 2-16

SERVICE INFORMATION

GENERAL

- This section covers removal and installation of the frame, body panels and exhaust system.
- For O_2 sensor removal/installation, refer to "PGM-FI SYSTEM" section (page 4-47).
- For assist headlight cover removal/installation, refer to "Lights/Meters/Switches" section (page 24-3).
- For meter cover removal/installation, refer to "Lights/Meters/Switches" section (page 24-14).
- Always replace the gaskets when removing the exhaust system.
- Always inspect the exhaust system for leaks after installation.

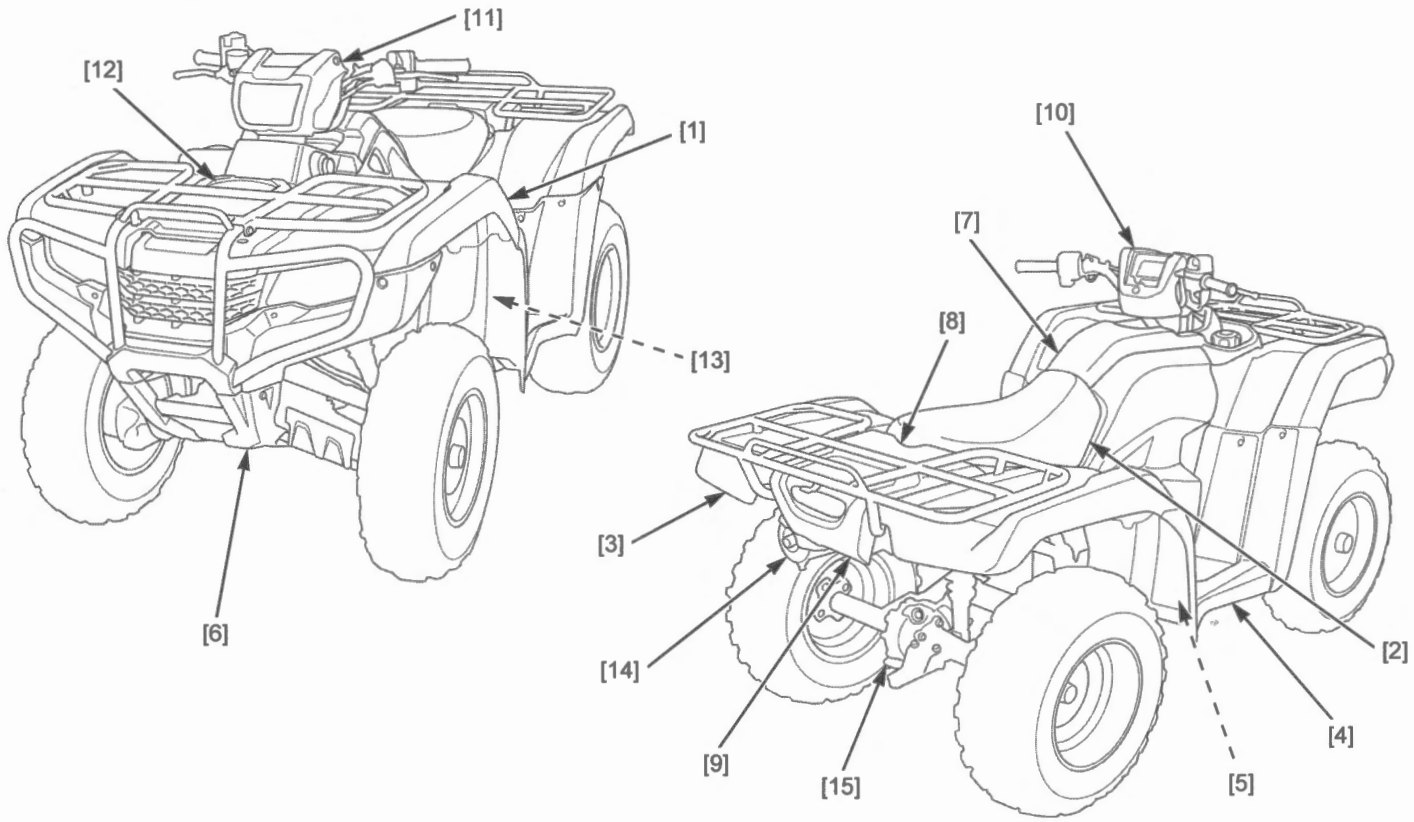
TROUBLESHOOTING

Excessive exhaust noise
- Broken exhaust system
- Exhaust gas leaks

Poor performance
- Deformed exhaust system
- Exhaust gas leaks
- Clogged muffler

BODY PANEL LOCATIONS

'14 model shown:

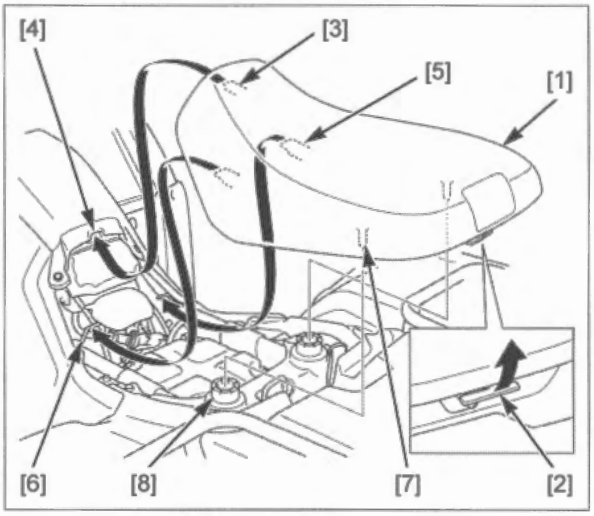


[1] FRONT FENDER/CARRIER (page 2-8)
[2] SEAT (page 2-3)
[3] REAR FENDER/CARRIER (page 2-13)
[4] CENTER MUDGUARD (page 2-5)
[5] STEP BRACKET (page 2-12)
[6] ENGINE GUARD (page 2-8)
[7] TANK COVER ASSEMBLY (page 2-4)
[8] REAR FENDER COVER (page 2-12)
[9] TOOL BOX LID (page 2-13)
[10] METER COVER (page 24-11)
[11] ASSIST HEADLIGHT COVER (page 24-3)
[12] RADIATOR CAP LID (page 2-3)
[13] OIL CHECK LID (page 2-3)
[14] EXHAUST SYSTEM (page 2-16)
[15] SKID PLATE (page 2-16)

SEAT

Unlock the seat [1] by pulling the release lever [2] up. Raise the rear of the seat, slide it rearward and remove it.

Install the seat by inserting the center prong [3] into the tank cover [4] and hooking the front prongs [5] to the seat retainers [6] of the frame.
Push the seat forward and align the mounting bosses [7] with the rubber mounts [8], then press down to lock it.

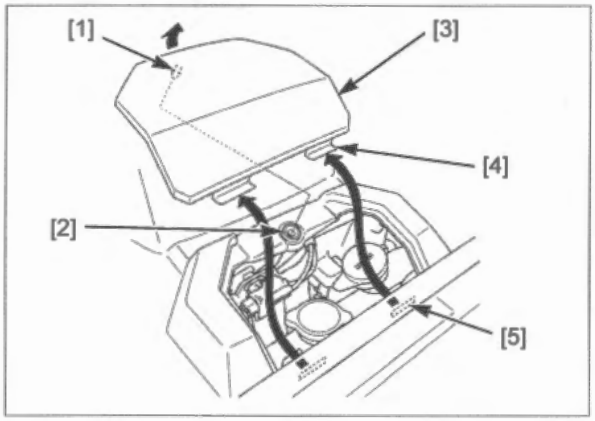


RADIATOR CAP LID

Release the boss [1] from the grommet [2] and remove the radiator cap lid [3]

Install the radiator cap lid by hooking the front hooks [4] to the slits [5] and aligning the boss with the grommet.

- Be careful not to dislodge the grommets.

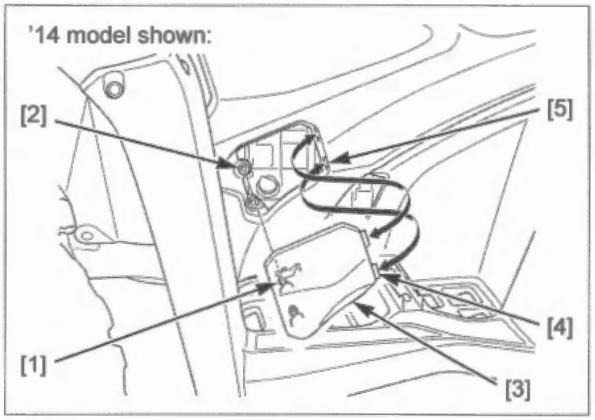


OIL CHECK LID

Release the bosses [1] from the grommets [2] and remove the oil check lid [3]

Install the oil check lid by hooking the rear hooks [4] to the slits [5] and aligning the bosses with the grommets.

- Be careful not to dislodge the grommets.



TANK COVER ASSEMBLY

REMOVAL/INSTALLATION

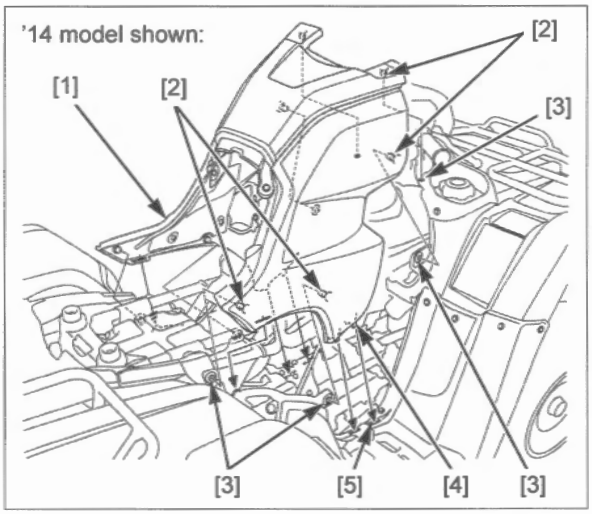
Remove the seat (page 2-3).

Remove the tank cover assembly [1] by releasing the bosses [2] from the grommets [3].

- Release the side bosses first, then the top two bosses.

Installation is in the reverse order of removal.

- Align the tabs [4] with the slits [5].
- Be careful not to dislodge the grommets.



DISASSEMBLY/ASSEMBLY

FM/FE models:

Remove the following:

- two assembly screws [1]
- six trim clips [2]
- side pocket screw [3] and side pocket [4]
- side covers [5] from the tank cover [6]

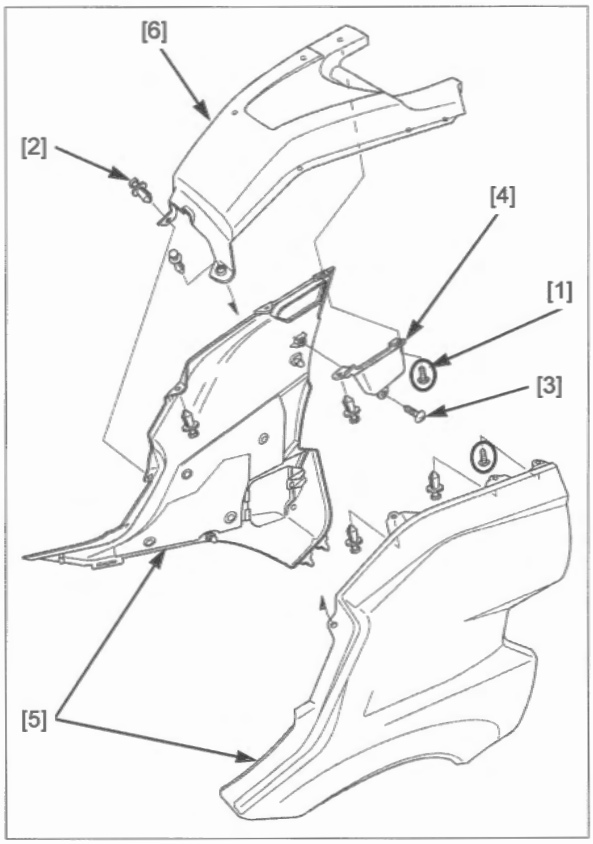
Assembly is in the reverse order of disassembly.

FA models:

Remove the following:

- two assembly screws [1]
- six trim clips [2]
- side covers [5] from the tank cover [6]

Assembly is in the reverse order of disassembly.



CENTER MUDGUARD

FM1/FM2/FE1/FE2 ('14 – '19):

NOTE:

- Take care not to scratch the front and rear fenders when removing and installing the center mudguard.

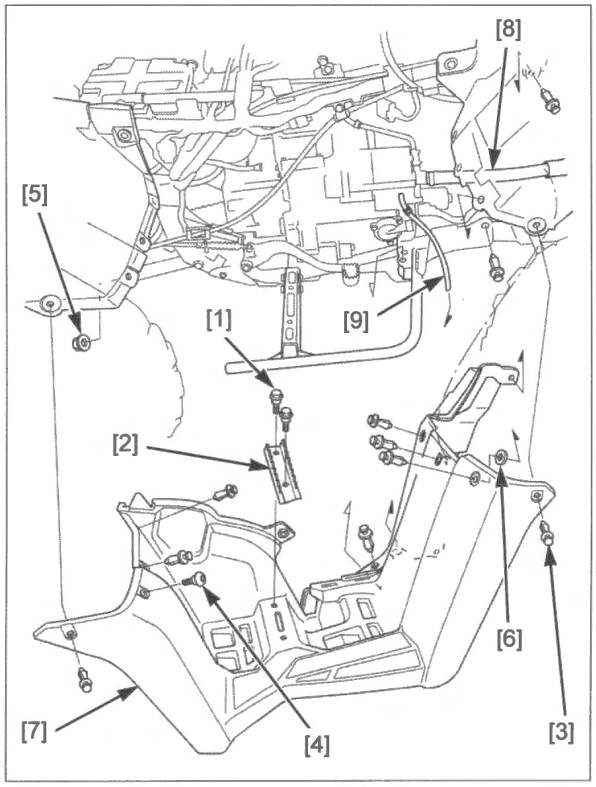
Remove the tank cover assembly (page 2-4).

Remove the following:

– setting bolts [1] and step [2]
– trim clips [3], socket bolt [4], nut [5] and washer [6]
– center mudguard [7]

RIght side: Release the water hose [8] and bleed hose [9] from the center mudguard.

Installation is in the reverse order of removal.



FM5/FM6/FM7/FA5/FA6/FA7 ('15 – '19):

NOTE:

- Take care not to scratch the front and rear fenders when removing and installing the center mudguard.

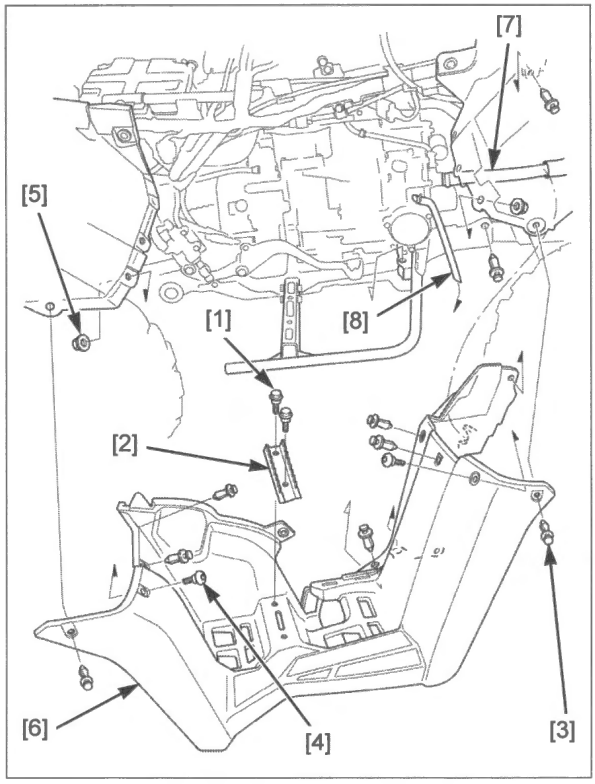
Remove the tank cover assembly (page 2-4).

Remove the following:

– setting bolts [1] and step [2]
– trim clips [3], socket bolts [4] and nuts [5]
– center mudguard [6]

RIght side: Release the water hose [7] and bleed hose [8] from the center mudguard.

Installation is in the reverse order of removal.



FM1/FM2/FM6/FE2/FA5/FA6/FA7 (After '19)

LEFT CENTER MUDGUARD

NOTE:

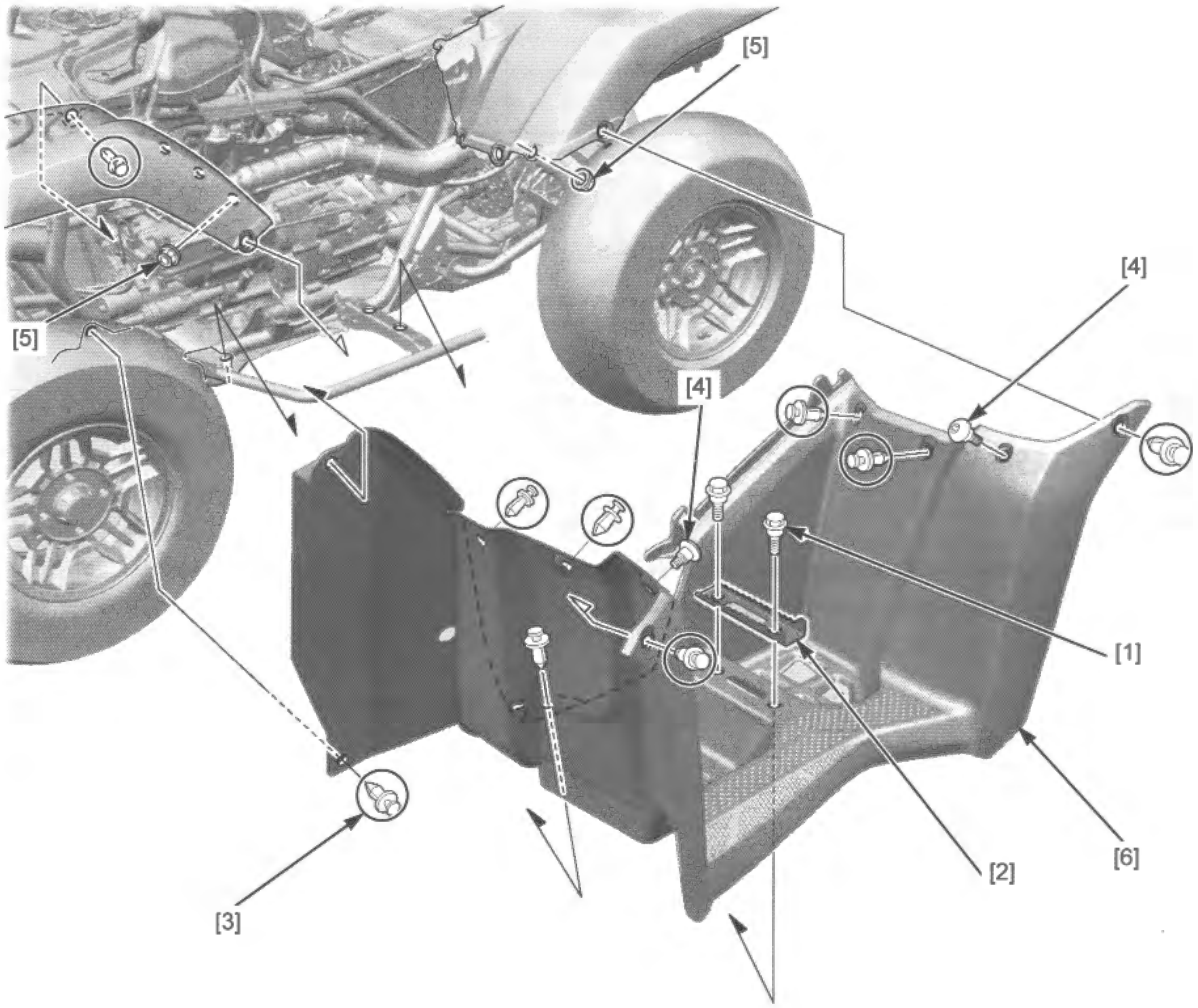
- Take care not to scratch the front and rear fenders when removing and installing the center mudguard.

Remove the tank cover assembly (page 2-4).

Remove the following:

- setting bolts [1] and step [2]
- trim clips [3], socket bolts [4] and nuts [5]
- left center mudguard [6]

Installation is in the reverse order of removal.



RIGHT CENTER MUDGUARD

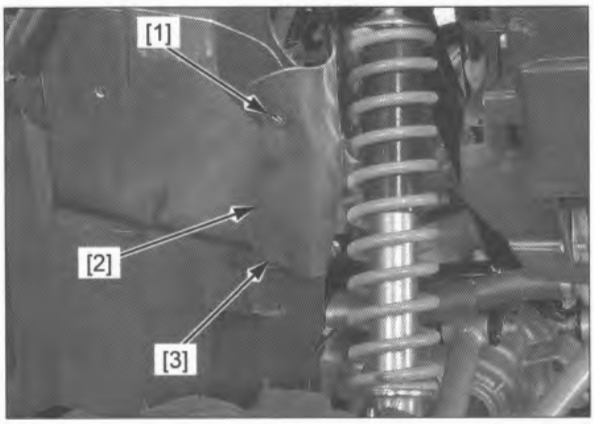
NOTE:

- Take care not to scratch the front and rear fenders when removing and installing the center mudguard.

Remove the following:

- tank cover assembly (page 2-4)
- trim clip [1] (AC type only)

AC type only: Release the canister cover A [2] from the hook [3].

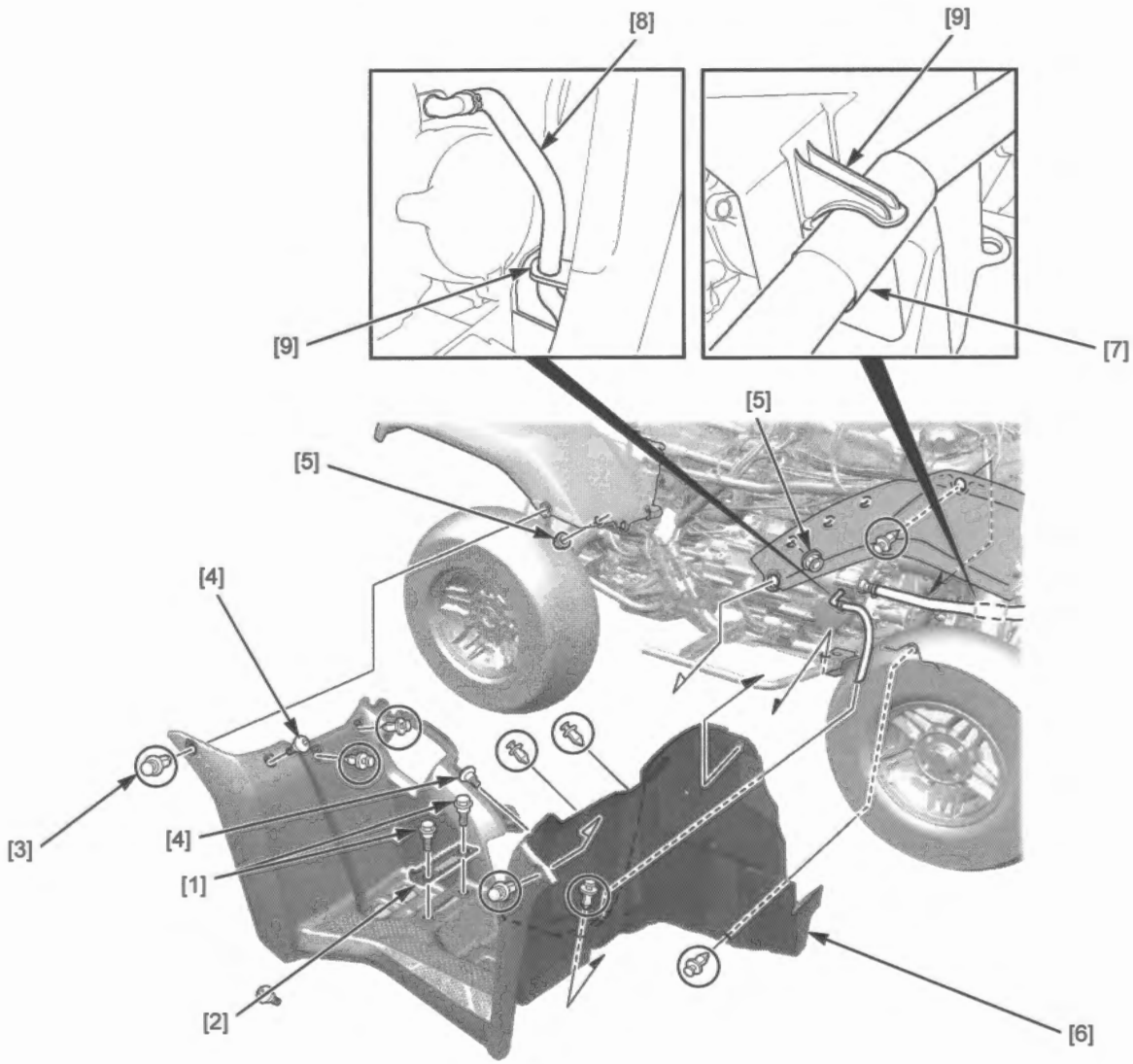


Remove the following:

- setting bolts [1] and step [2]
- trim clips [3], socket bolts [4] and nuts [5]
- right center mudguard [6]

Release the water hose [7] and bleed hose [8] from the guides [9] of the right center mudguard.

Installation is in the reverse order of removal.

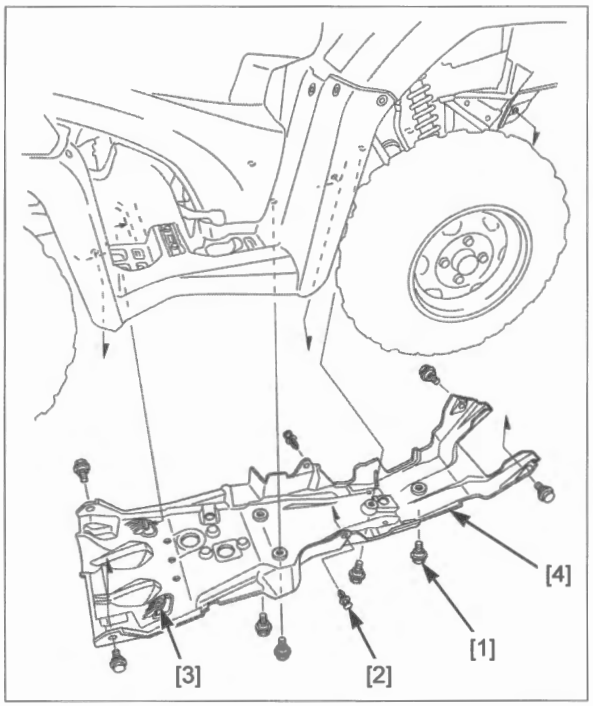


ENGINE GUARD

Remove the setting bolts [1] and trim clips [2].

Release the hooks [3] of the engine guard [4] from the frame and then remove the engine guard.

Installation is in the reverse order of removal.

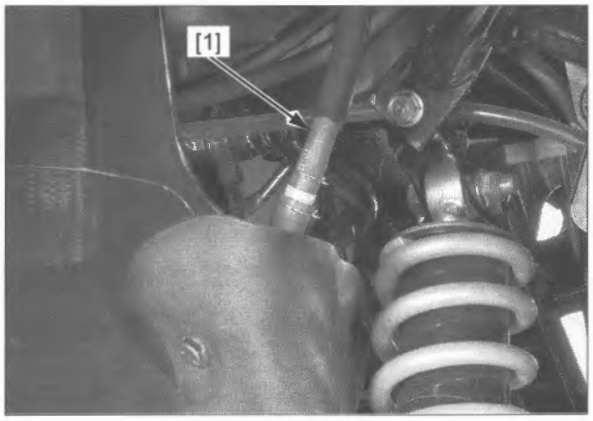


FRONT FENDER/CARRIER

REMOVAL/INSTALLATION

FM1/FM2/FE1/FE2:

After '19 AC type: Disconnect the air vent hose [1].



- Work in a well ventilated area. Smoking or allowing flames or sparks in the work area or where gasoline is stored can cause a fire or explosion.

Remove the following:

– tank cover assembly (page 2-4)
– radiator cap lid (page 2-3)

Disconnect the following:

– accessory socket 2P (Black) connector [1]
– headlight sub harness 3P connector [2]

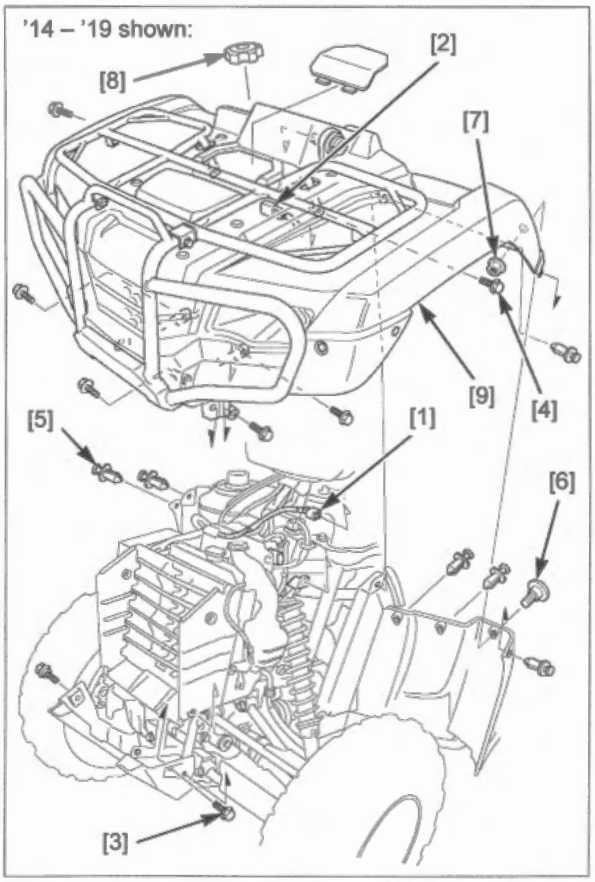
Remove the following:

– setting bolts [3]
– bolts [4]
– trim clips [5], socket bolts [6] and nuts [7]
– fuel tank cap [8]
– front fender/carrier assembly [9]

Install the fuel tank cap.

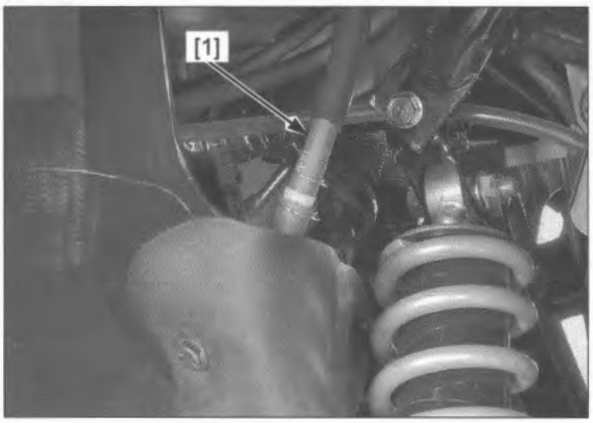
Installation is in the reverse order of removal.

- Route the wires properly (page 1-31).



FM5/FM6/FM7/FA5/FA6/FA7:

After '19 AC type: Disconnect the air vent hose [1].



- Work in a well ventilated area. Smoking or allowing flames or sparks in the work area or where gasoline is stored can cause a fire or explosion.

Remove the following:

– tank cover assembly (page 2-4)
– radiator cap lid (page 2-3)

Disconnect the following:

– accessory socket 2P (Black) connector ('14 – '19) [1]
– accessory socket 2P (Red) connector (After '19) [1]
– headlight sub harness 3P connector [2]

Remove the following:

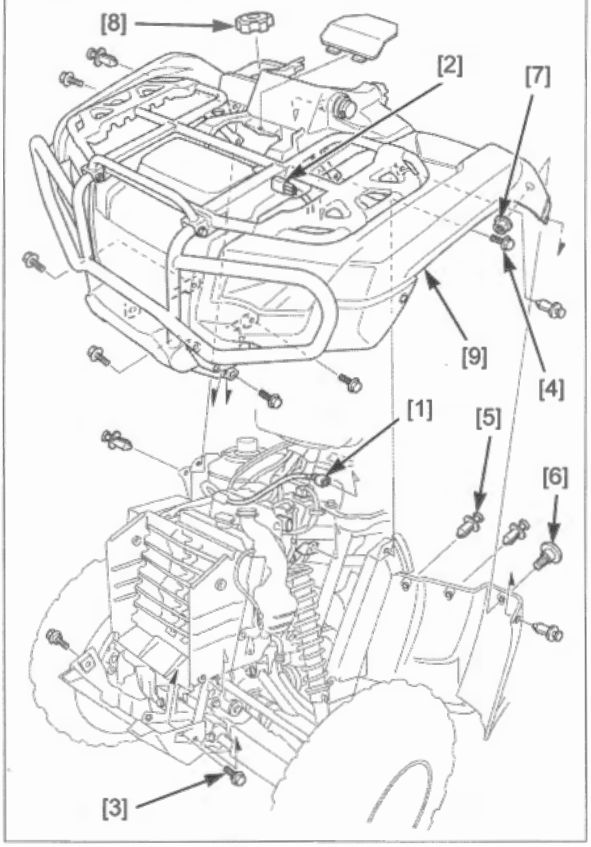
– setting bolts [3]
– bolts [4]
– trim clips [5], socket bolts [6] and nuts [7]
– fuel tank cap [8]
– front fender/carrier assembly [9]

Install the fuel tank cap.

Installation is in the reverse order of removal.

- Route the wires properly (page 1-31).

'14 – '19 shown:



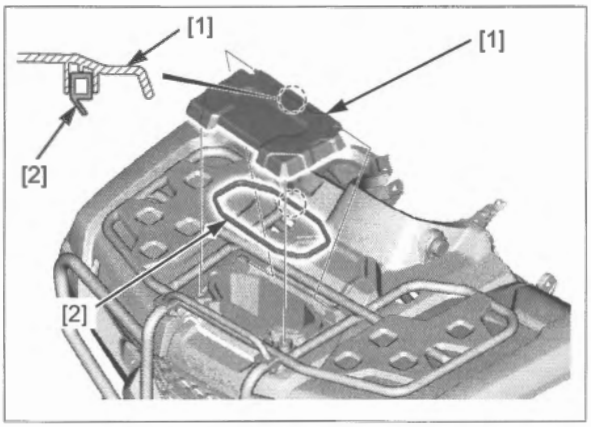
DISASSEMBLY/ASSEMBLY

After '19: Remove the following:

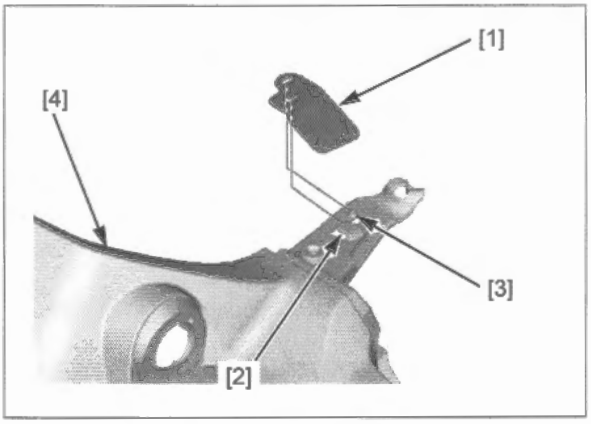
– pocket lid [1]
– rubber seal [2]

NOTE:

- When installing the rubber seal, install it as shown.



After '19 (FM1/FM2/FE2): Release the center cover rubber [1] from the hook [2] and boss [3] of the front center cover [4].



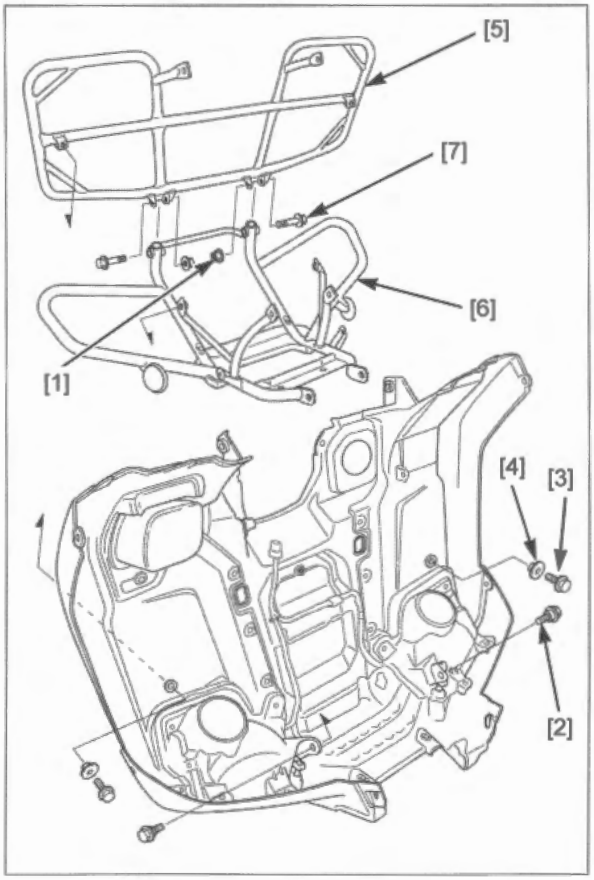
Loosen the nuts [1].

Remove the following:

- setting bolts [2]
- bolts [3] and flange collars [4]
- front carrier [5] and front carry pipe [6] assembly.

Remove the nuts and bolts [7] and separate the front carrier from the front carry pipe.

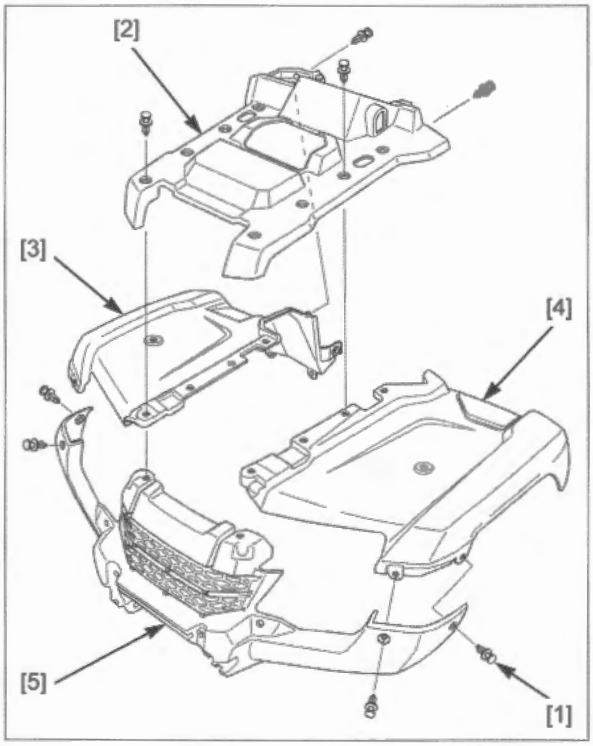
- For headlight removal/installation, see "Lights/Meters/Switches" section (page 24-5).
- For accessory socket removal/installation, see "Lights/Meters/Switches" section (page 24-12).



Remove the trim clips [1] and separate the following:

- front center cover [2]
- right front fender [3]
- left front fender [4]
- front grille [5]

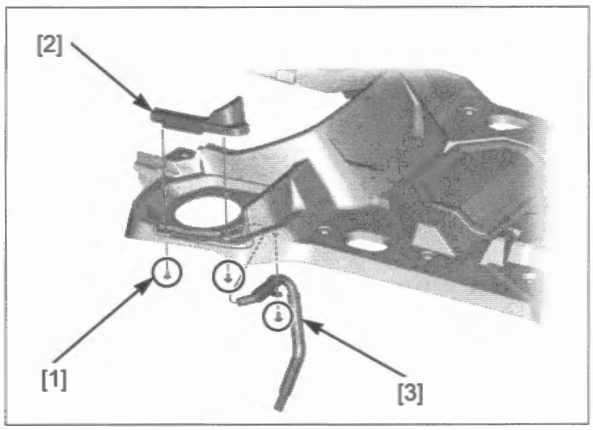
Assembly is in the reverse order of disassembly.



After '19 AC type: Remove the following from the front cover:

- screws [1]
- air vent cover [2]
- air vent hose [3]

Assembly is in the reverse order of disassembly.



REAR FENDER COVER

- Be careful not to scratch the cover with the carrier pipe.

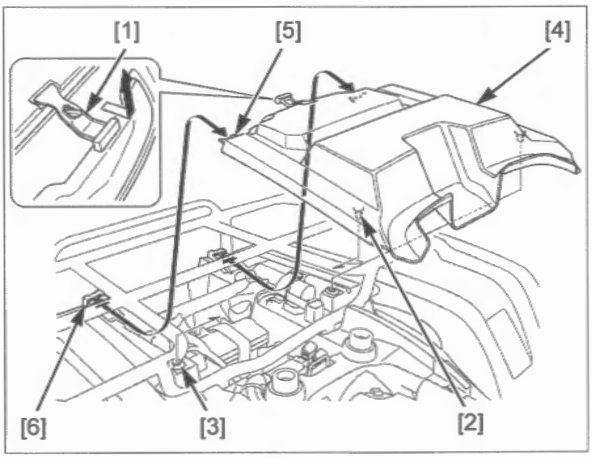
Remove the seat (page 2-3).

Unhook the retaining strap [1] from the tool box lid. Release the bosses [2] from the grommets [3] and remove the rear fender cover [4] by sliding it forward.

Be careful not to dislodge the grommets.

Installation is in the reverse order of removal.

- Align the tabs [5] with the slits [6].



STEP BRACKET

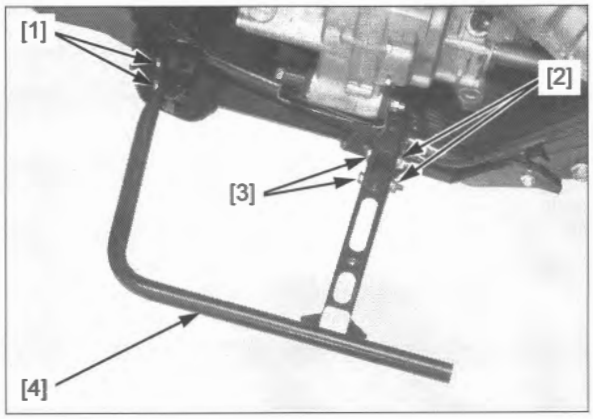
Remove the center mudguard (page 2-5).

Remove the following:

- bolts (short) [1]
- nuts [2]
- bolts (long) [3]
- step bracket [4]

Installation is in the reverse order of removal.

TORQUE:
Step bracket bolt:
32 N·m (3.3 kgf·m, 24 lbf·ft)

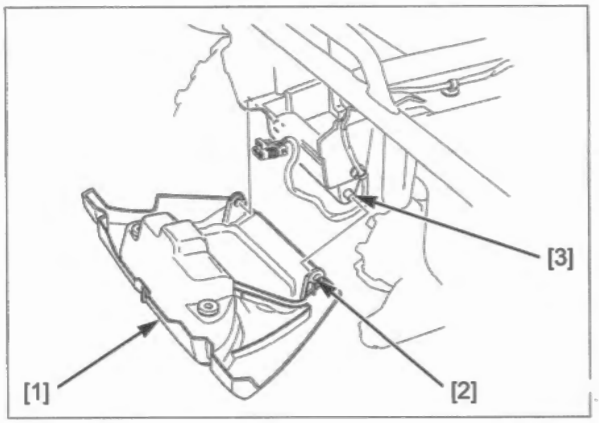


TOOL BOX LID

Remove the brake/taillight (page 24-6).

Remove the tool box lid [1] by unhooking its holes [2] from the rear fender bosses [3].

Installation is in the reverse order of removal.



REAR FENDER/CARRIER

REMOVAL/INSTALLATION

FM1/FM2/FE1/FE2:

Remove the following:

- tank cover assembly (page 2-4)
- tool box lid (page 2-13)
- rear fender cover (page 2-12)
- battery [1] (page 23-5)

Disconnect the stator 3P (Gray) connector [2] and regulator/rectifier 3P (Black) connector [3].

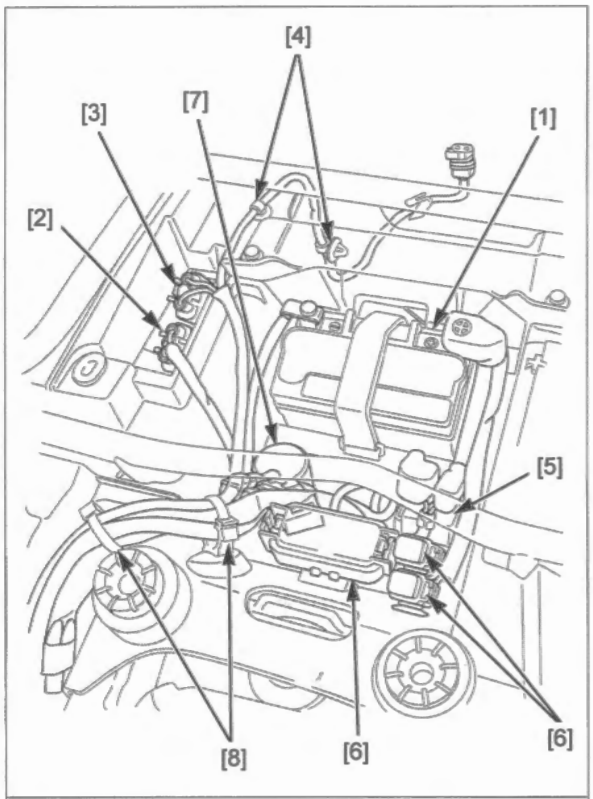
Remove the following from the rear fender:

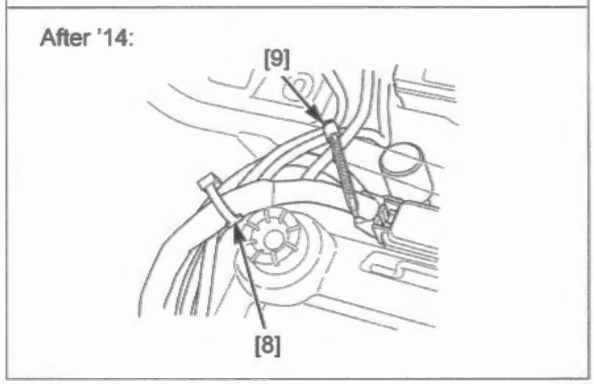
- wire clips [4]
- starter relay switch [5]
- fuse boxes [6]

CM/ III A types: Remove the condenser [7] from the rear fender.

'14 model: Unlock the wire clamps [8] and release the wires and cables from the rear fender.

After '14 model: Unlock the wire clamp [8], remove the wire band [9] and release the wires and cables from the rear fender.



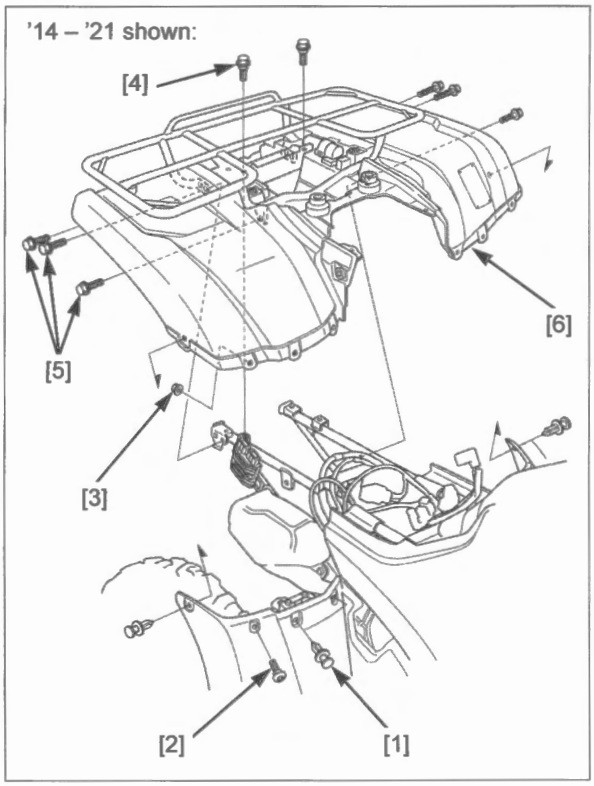


Remove the following:

– trim clips [1], socket bolt [2], nut [3]
– setting bolts [4]
– bolts [5]
– rear fender/carrier assembly [6]

Installation is in the reverse order of removal.

• Route the wires and cables properly (page 1-31).



FM5/FM6/FM7/FA5/FA6/FA7:

Remove the following:

– tool box lid (page 2-13)
– rear fender cover (page 2-12)
– battery [1] (page 23-5)

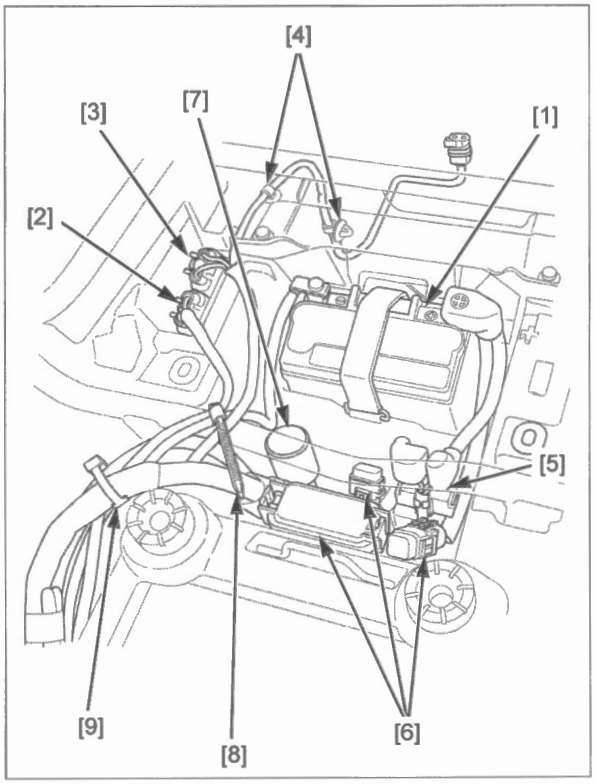
Disconnect the stator 3P (Gray) connector [2] and regulator/rectifier 3P (Black) connector [3].

Remove the following from the rear fender:

– wire clips [4]
– starter relay switch [5]
– fuse boxes [6]

CM type: Remove the condenser [7] from the rear fender.

Remove the wire band [8], unlock the wire clamp [9] and release the wires and cables from the rear fender.



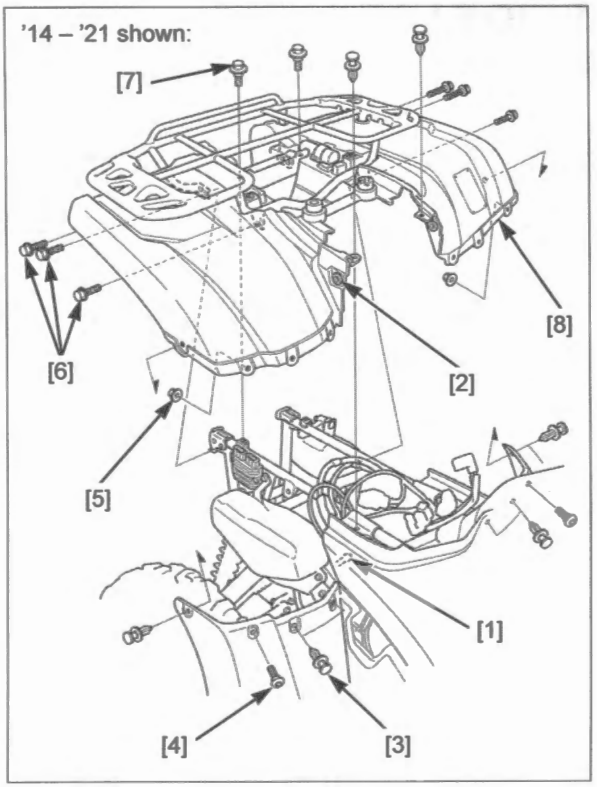
Spread the rear side of tank cover assembly and release the bosses [1] from the grommets [2].

Remove the following:

– trim clips [3], socket bolts [4] and nuts [5]
– setting bolts [6]
– bolts [7]
– rear fender/carrier assembly [8]

Installation is in the reverse order of removal.

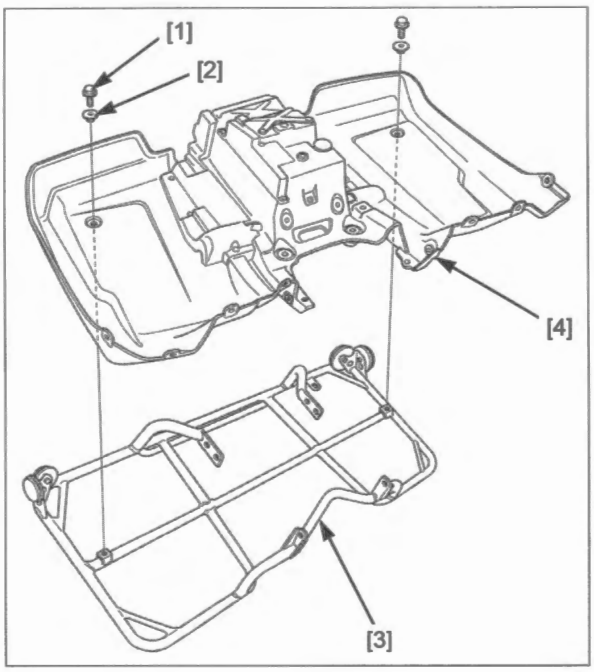
- Route the wires and cables properly (page 1-31).



DISASSEMBLY/ASSEMBLY

Remove the bolts [1], flange collars [2] and separate the rear carrier [3] from the rear fender [4].

Assembly is in the reverse order of disassembly.

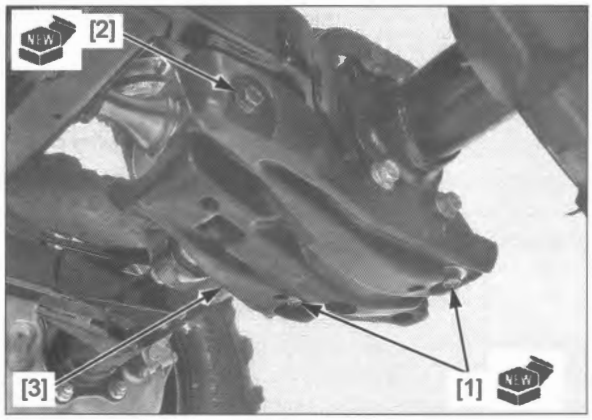


SKID PLATE

FM1/FM2/FE1/FE2:

Remove the bolts [1], setting bolt [2] and skid plate [3].

Install the skid plate and tighten new bolts securely.

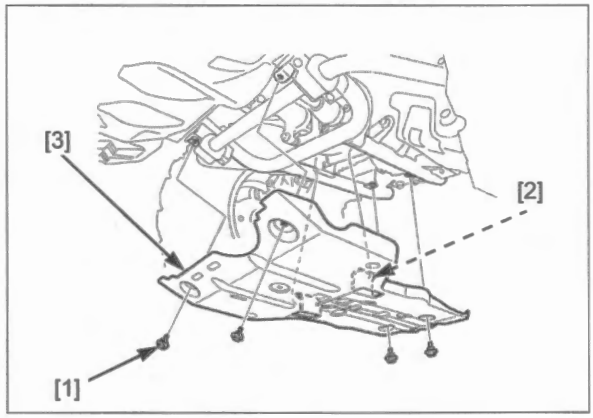


FM5/FM6/FM7/FA5/FA6/FA7:

Remove the setting bolts [1].

Release the hooks [2] from the frame and then remove the skid plate [3].

Installation is in the reverse order of removal.



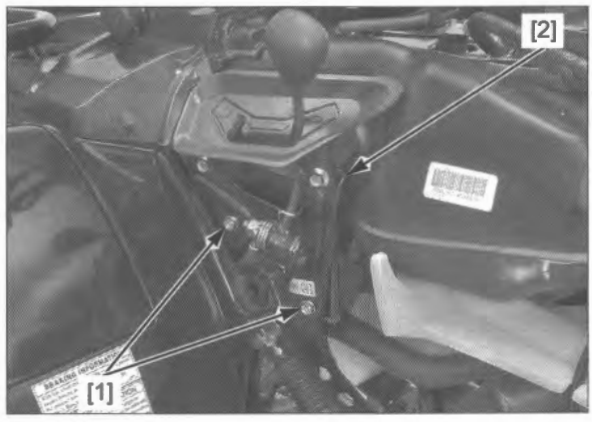
EXHAUST SYSTEM

REMOVAL/INSTALLATION

FM/FE models: Remove the tank cover assembly (page 2-4).

FA models: Remove the left center mudguard (page 2-5).

Remove the bolts [1] and range select lever bracket [2].



Turn the ignition switch OFF.

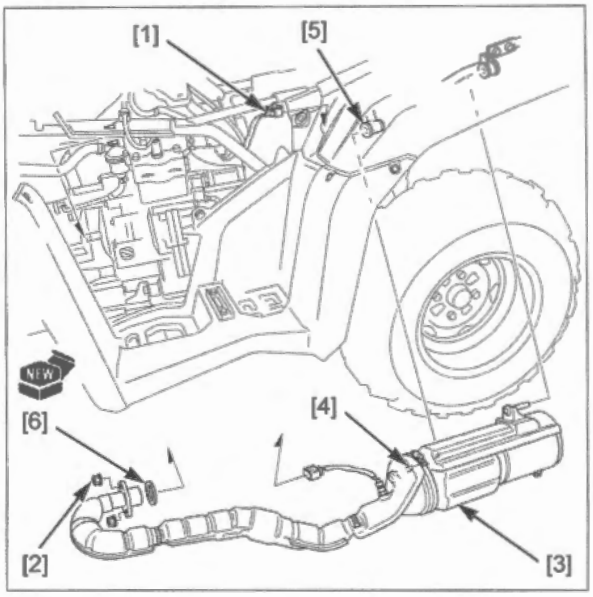
Disconnect the O_2 sensor 4P (Black) connector [1]

Remove the following:

- joint nuts [2]
- muffler [3] (by releasing its bosses [4] from the grommets [5])
- gasket [6]

Installation is in the reverse order of removal.

- Always replace the gasket with a new one.
- Apply a soap and water mix to the grommets.
- After installation, inspect the exhaust system for leaks.



EXHAUST PIPE STUD BOLT REPLACEMENT

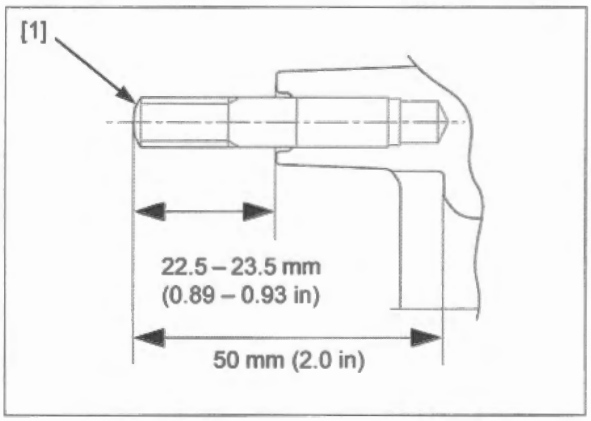
Thread two nuts to the stud bolt [1] and tighten them together, then use a wrench on them to turn the stud bolt out.

Install the stud bolts with their rounded end facing out.

Install and tighten new stud bolts into the cylinder head to the specified torque.

TORQUE: 6 N·m (0.6 kgf·m, 4.4 lbf·ft)

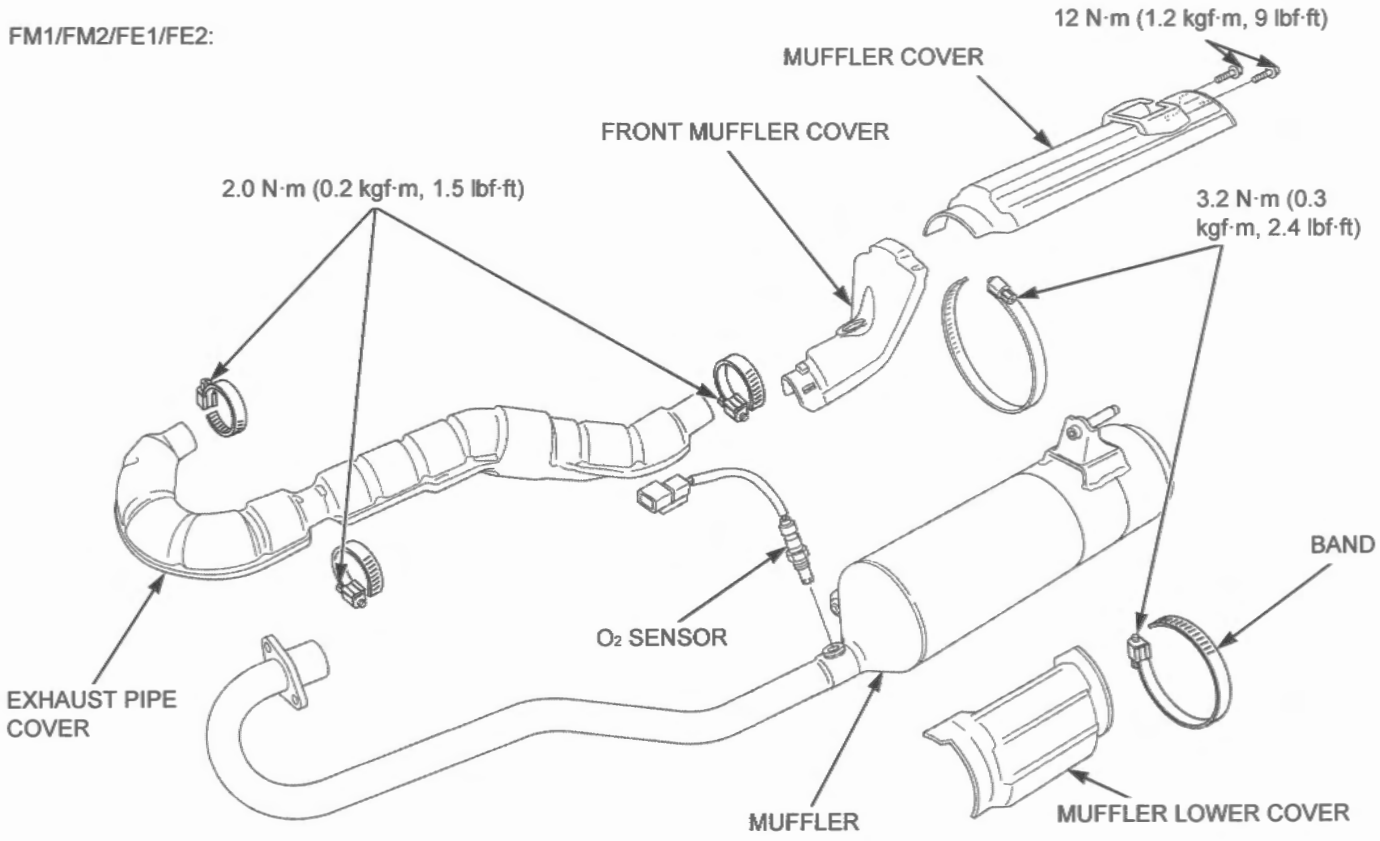
After tightening the stud bolts, check that the length from the bolt head to the cylinder head surface is within specification.



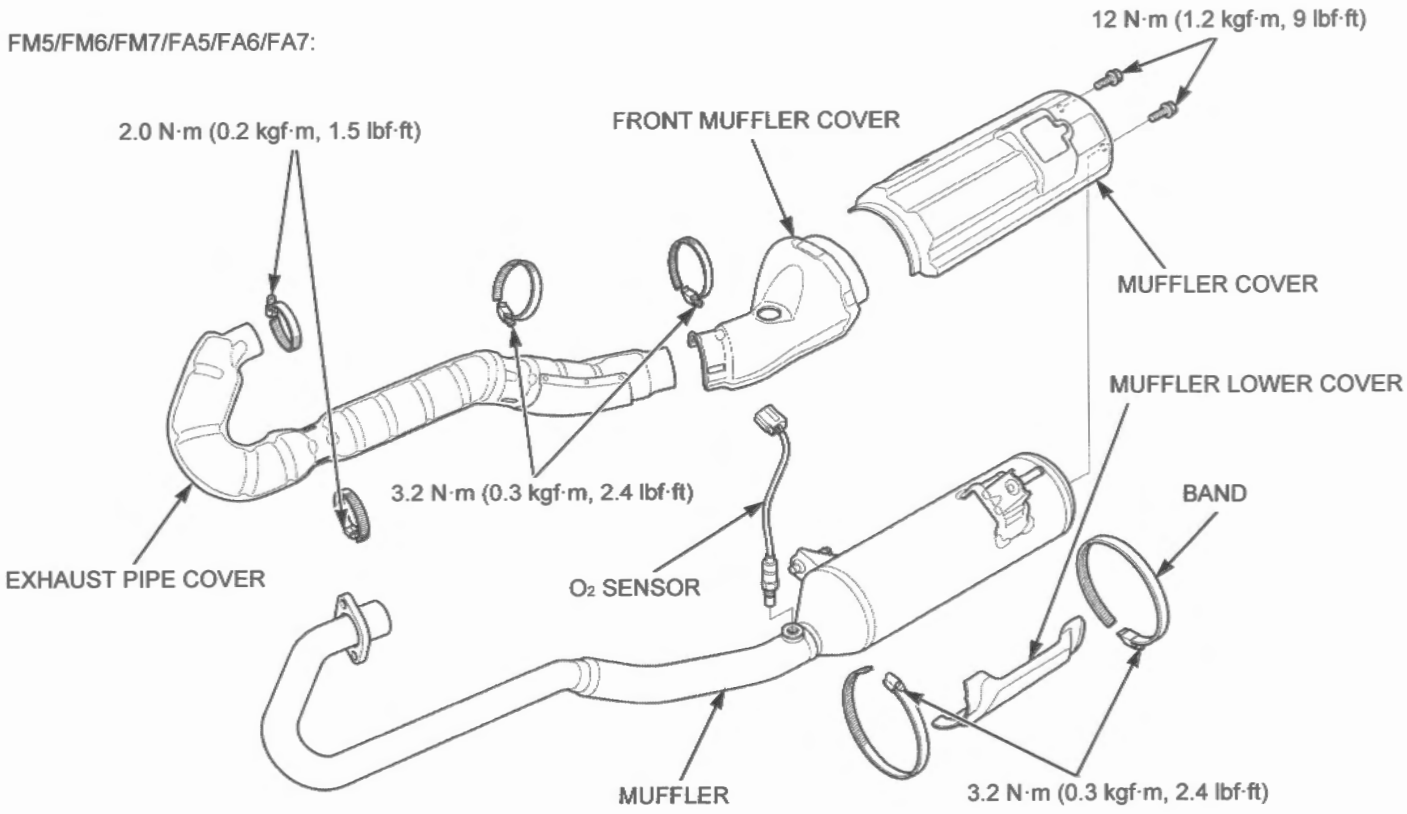
DISASSEMBLY/ASSEMBLY

- For O_2 sensor removal/installation, refer to "PGM-FI SYSTEM" section (page 4-47).

FM1/FM2/FE1/FE2:



FM5/FM6/FM7/FA5/FA6/FA7:



SERVICE INFORMATION 3-2
MAINTENANCE MINDER INDICATOR 3-2
MAINTENANCE SCHEDULE 3-3
FUEL LINE 3-4
THROTTLE OPERATION 3-4
AIR CLEANER 3-5
AIR CLEANER HOUSING DRAIN TUBE 3-7
SPARK PLUG 3-7
VALVE CLEARANCE 3-8
ENGINE OIL 3-13
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ENGINE IDLE SPEED 3-15
EVAPORATIVE EMISSION CONTROL SYSTEM (After '19 AC type) 3-16
RADIATOR COOLANT 3-16
COOLING SYSTEM 3-17
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SUSPENSION 3-29
SPARK ARRESTER 3-30
NUTS, BOLTS, FASTENERS 3-30
WHEELS/TIRES 3-30
TIE-ROD AND JOINT BOOTS 3-31
STEERING SHAFT HOLDER BEARING 3-31
STEERING SYSTEM 3-31

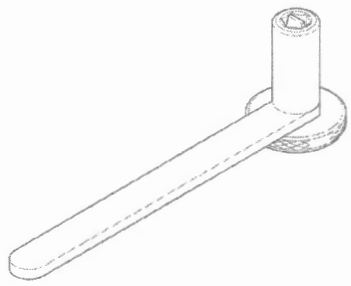
SERVICE INFORMATION

GENERAL

- Place the vehicle on level ground before starting any work.

TOOL

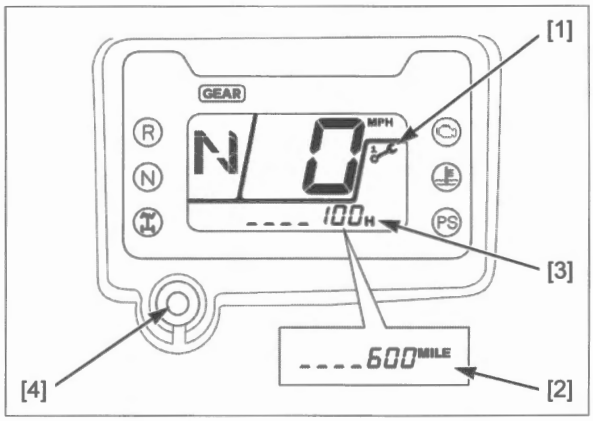
Tappet Adjusting Wrench Set
(HEX 10)
07908-3230000



MAINTENANCE MINDER INDICATOR

The maintenance minder indicator [1] appears when the mileage [2] or operating hour [3] reaches the maintenance interval specified on the maintenance schedule (page 3-3).

	Initial Maintenance Appears at 100 miles (150 km) or 20 operating hours, whichever comes first.
1	**Regular Maintenance Interval 1** Appears 600 miles (1,000 km) or 100 operating hours after the Initial Maintenance or Regular Maintenance Interval 2 is performed and maintenance minder is reset, whichever comes first in the maintenance schedule.
2	**Regular Maintenance Interval 2** Appears 600 miles (1,000 km) or 100 operating hours after Regular Maintenance Interval 1 is performed and maintenance minder is reset, whichever comes first in the maintenance schedule.



When the maintenance tripmeter or maintenance hourmeter reaches to 0, the maintenance minder indicator changes its display. When the maintenance tripmeter or maintenance hourmeter is selected, the maintenance minder indicator and lower part of the multi-function display start blinking. When another mode is selected, the maintenance minder indicator appears in the display.

Reset the maintenance tripmeter/maintenance hourmeter after the maintenance.

To reset the maintenance tripmeter/maintenance hourmeter, press and hold the mode select button [4] and turn the ignition switch ON.

The maintenance minder indicator will appear, then it will blink twice, and the multi-function display will temporarily show all the modes and digital segments.

NOTE:

- Reset operation will be cancelled if the mode select button is released before the indicator blinks twice.

MAINTENANCE SCHEDULE

Perform the PRE-RIDE INSPECTION in the Owner's Manual at each scheduled maintenance period.

I: Inspect and clean, adjust, lubricate or replace if necessary. C: Clean. R: Replace. A: Adjust. L: Lubricate.

	ITEMS	FREQUENCY / WHICHEVER COMES FIRST		INITIAL MAINTENANCE	REGULAR MAINTENANCE INTERVAL		REFER TO PAGE
			mi	100	600	1,200	
			km	150	1,000	2,000	
			MONTH	1	6	12	
			HOURS	20	100	200	
*	FUEL LINE					I	3-4
*	THROTTLE OPERATION					I	3-4
	AIR CLEANER	NOTE 1			C	C	3-5
	AIR CLEANER HOUSING DRAIN TUBE	NOTE 2			I	I	3-7
	SPARK PLUG				I	I	3-7
*	VALVE CLEARANCE			I	I	I	3-8
	ENGINE OIL		INITIAL = 100 mi (150 km), 20 operating hours or 1 month: R REGULAR = Every 600 mi (1,000 km), 100 operating hours or 12 months: R				3-13
	ENGINE OIL FILTER						3-14
*	ENGINE IDLE SPEED			I	I	I	3-15
*	EVAPORATIVE EMISSION CONTROL SYSTEM (After'19 AC type)	NOTE 4			I: Every 2 years		3-16
	RADIATOR COOLANT	NOTE 3			I	I	3-16
*	COOLING SYSTEM	NOTE 2			I	I	3-17
	DRIVE TRAIN BOOTS				I	I	3-18
	REAR FINAL GEAR OIL (FM1/FM2/FE1/FE2)				(R: Every 2 years)	I	3-19
	REAR FINAL GEAR CASE OIL AND DIFFERENTIAL OIL (FM5/FM6/FM7/FA5/FA6/FA7)				(R: Every 2 years)	I	3-20
	FRONT FINAL GEAR OIL				(R: Every 2 years)	I	3-21
*	RANGE SELECT SYSTEM (FA models)					I	3-22
*	BRAKE FLUID	NOTE 3			I	I	3-23
*	BRAKE SHOES WEAR (FM1/FM2/FE1/FE2)	NOTE 1, 2				I	3-24
*	BRAKE PADS WEAR	NOTE 1, 2				I	3-24
*	BRAKE LIGHT SWITCH			I	I	I	3-25
	BRAKE SYSTEM			I	I	I	3-25
*	REVERSE INHIBITOR SYSTEM (FM models and '15 – '19 FE/FA models)			I	I	I	3-28
	GUARDS				I	I	3-29
*	CLUTCH SYSTEM (FM/FE models)			I	I	I	3-29
*	SUSPENSION				I	I	3-29
*	SPARK ARRESTER				C	C	3-30
*	NUTS, BOLTS, FASTENERS			I		I	3-30
**	WHEELS/TIRES			I	I	I	3-30
**	TIE-ROD AND JOINT BOOTS			I	I	I	3-31
**	STEERING SHAFT HOLDER BEARINGS					I	3-31
**	STEERING SYSTEM					I	3-31

* Should be serviced by a dealer, unless the owner has proper tools and service data and is mechanically qualified.

** In the interest of safety, we recommend these items be serviced only by a dealer.

NOTES:

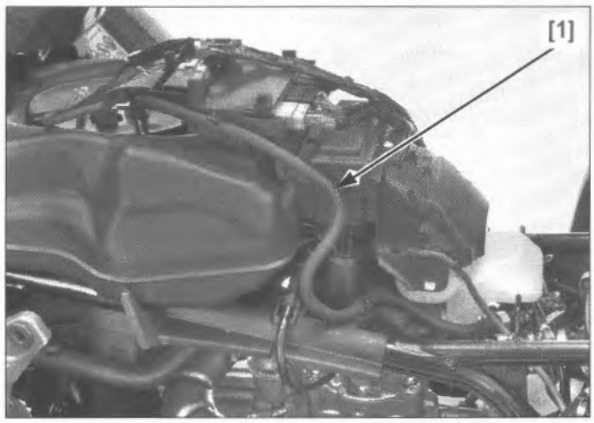
1. Service more frequently when riding in dusty areas, sand or snow.
2. Service more frequently after riding in very wet or muddy conditions.
3. Replace every 2 years. Replacement requires mechanical skill.
4. California type only.

FUEL LINE

Remove the tank cover assembly (page 2-4).

Check the fuel line [1] for deterioration, cracks, damage or leakage.

Replace the fuel hose if necessary.



THROTTLE OPERATION

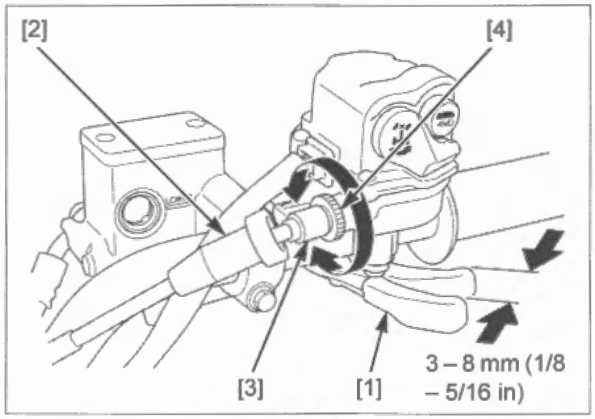
Check for any deterioration or damage to the throttle cable. Check the throttle lever [1] for smooth operation. Check that the throttle opens and automatically closes in all steering positions.

If the throttle lever does not return properly, overhaul and lubricate the throttle housing (page 18-9).
If the throttle lever still does not return properly, replace the throttle cable.

With the engine idling, turn the handlebar all the way to the right and left to ensure that the idle speed does not change. If idle speed increases, check the throttle lever freeplay and the throttle cable connections.

Measure the throttle lever freeplay at the tip of the throttle lever.

THROTTLE LEVER FREEPLAY:
3 – 8 mm (1/8 – 5/16 in)



Throttle lever freeplay can be adjusted at either end of the throttle cable. Minor adjustments are made with the upper adjuster.

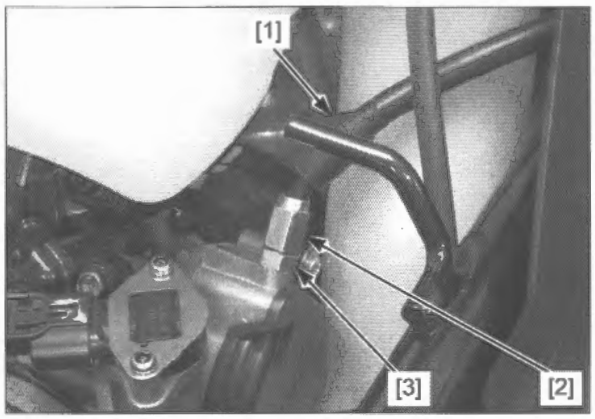
Slide the rubber boot [2] off the adjuster [3].
Loosen the lock nut [4], turn the adjuster as required and tighten the lock nut.
Install the rubber boot securely.

Major adjustments are made with the lower adjuster.

Remove the seat (page 2-3).

Slide the rubber boot [1] off the adjuster [2].
Loosen the lock nut [3], turn the adjuster as required and tighten the lock nut.
Install the rubber boot securely.

Recheck the throttle operation.



AIR CLEANER

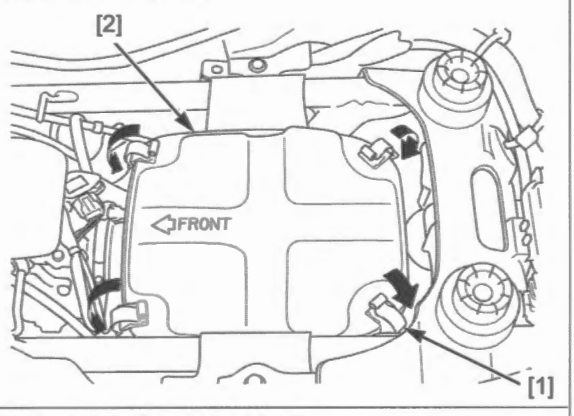
NOTE:

- If the vehicle is used in dusty areas, sand or snow, more frequent inspections are required.

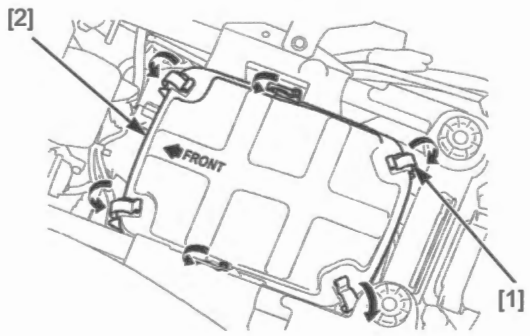
Remove the seat (page 2-3).

Unlock the retaining clips [1] and remove the air cleaner cover [2].

FM1/FM2/FE1/FE2:

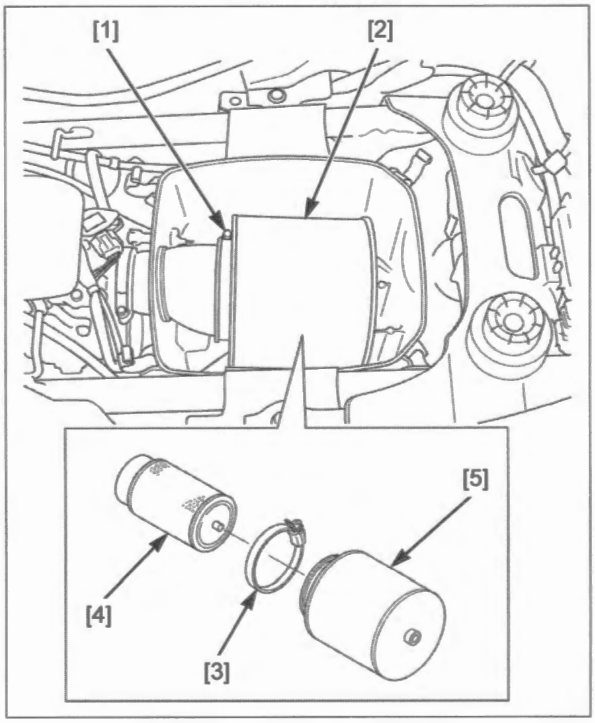


FM5/FM6/FM7/FA5/FA6/FA7:



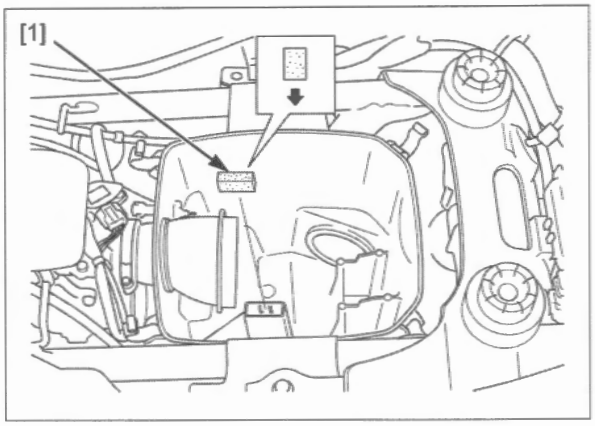
Loosen the band screw [1] and remove the air cleaner element assembly [2].

Remove the element band [3] and element core [4] from the air cleaner element [5].

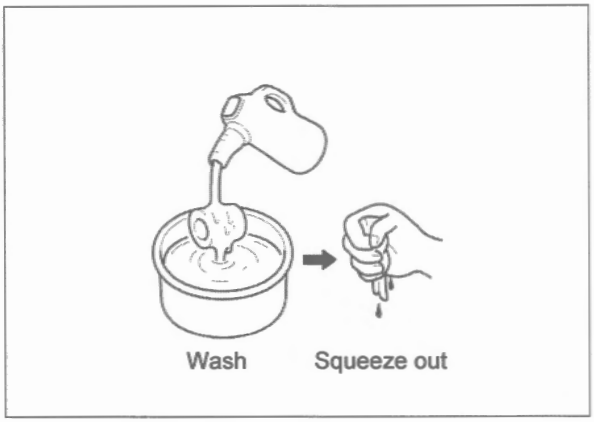


Remove the dust filter [1] from the element holder in the air cleaner housing.

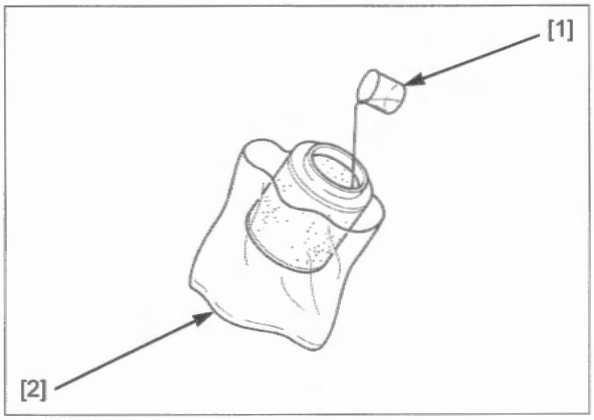
Check the dust filter for dirt, and clean it if necessary.



Wash the element and filter in non-flammable or high flash point solvent.
Squeeze out the solvent thoroughly, and allow the element and filter to dry.



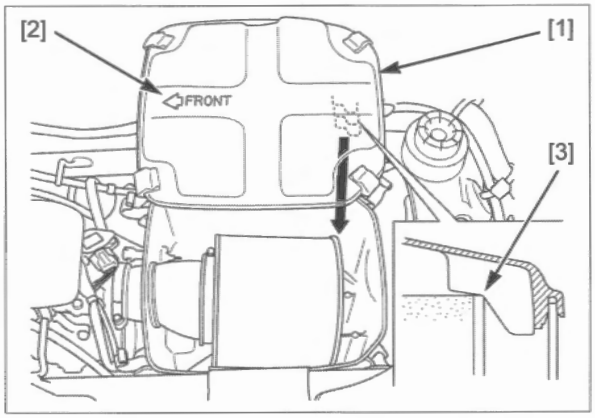
Apply approximately 17 – 23 g (0.6 – 0.8 oz) of Pro Honda Foam Filter Oil [1] or equivalent oil from the inside of the element.
Place the element into a plastic bag [2] and spread the oil evenly by hand.



Installation is in the reverse order of removal.

- Clean the inside of the air cleaner housing and cover.
- Make sure the rubber seal in the cover is in position and in good condition.
- Install the air cleaner cover [1] with the arrow [2] facing forward by aligning the stepped area [3] with the element.

Install the seat (page 2-3).



AIR CLEANER HOUSING DRAIN TUBE

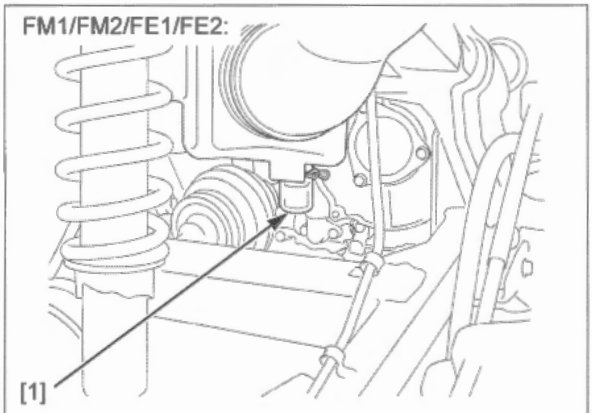
NOTE:

- If the vehicle is used in very wet or muddy conditions, more frequent inspections are required.

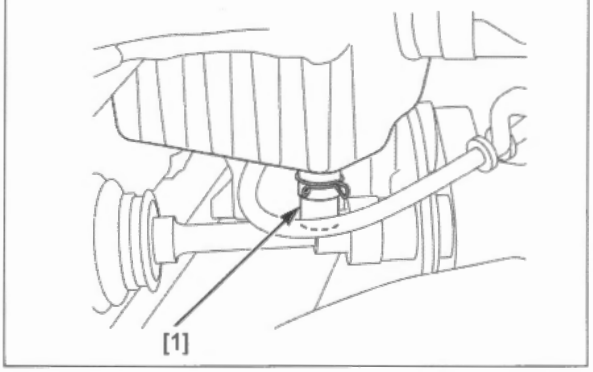
Remove the drain tube [1] from the bottom of the air cleaner housing to empty any deposits.

Install the drain tube securely.

FM1/FM2/FE1/FE2:



FM5/FM6/FM7/FA5/FA6/FA7:



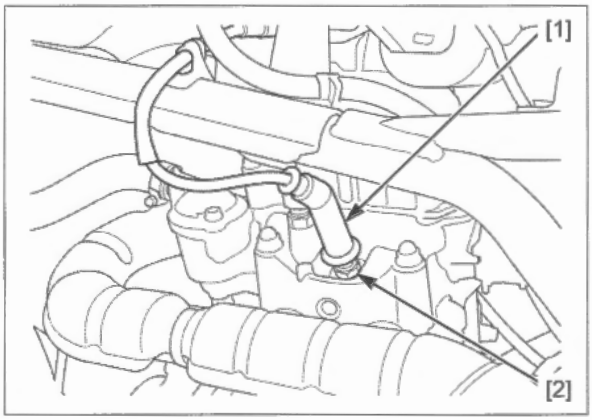
SPARK PLUG

Remove the tank cover assembly (page 2-4).

Clean around the spark plug base with compressed air before removing the plug, and be sure that no debris is allowed to enter into the combustion chamber.

Disconnect the spark plug cap [1] and clean around the spark plug base.

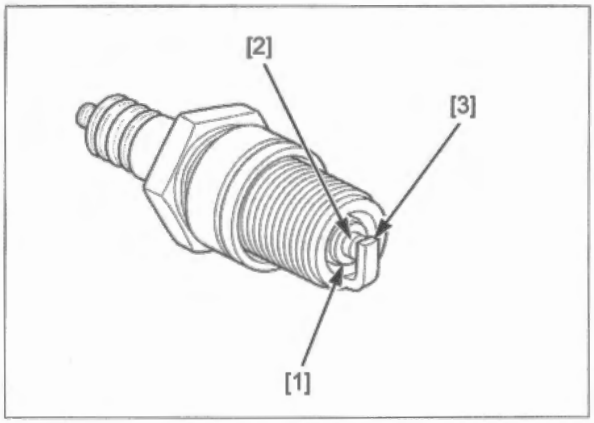
Remove the spark plug [2].



Check the insulator [1] for cracks or damage, and the electrodes for wear, fouling or discoloration. Replace the plug if necessary.

RECOMMENDED SPARK PLUG:
NGK: BKR5E-11
DENSO: K16PR-U11

Clean the spark plug center electrode [2] and side electrode [3] with a wire-type brush or special plug cleaner.



Check the spark plug gap between the center and side electrodes with a wire-type feeler gauge.

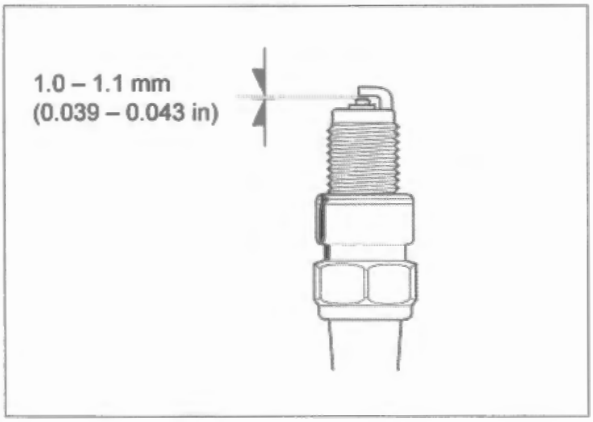
SPARK PLUG GAP: 1.0 – 1.1 mm (0.039 – 0.043 in)

If necessary, adjust the gap by bending the side electrode carefully.

Install and hand tighten the spark plug to the cylinder head, then tighten the spark plug to the specified torque.

TORQUE: 22 N·m (2.2 kgf·m, 16 lbf·ft)

Connect the spark plug cap and install the tank cover assembly (page 2-4).



VALVE CLEARANCE

NOTE:
- Inspect and adjust the valve clearance while the engine is cold (below 35°C/95°F).
- Check the engine idle speed after the valve clearance inspection (page 3-15).

Remove the tank cover assembly (page 2-4).

Remove the trim clips [1] from both right and left sides.



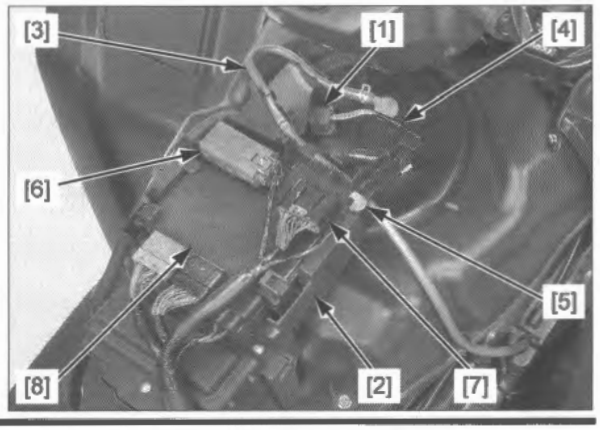
Disconnect the fuel pump unit 4P (Gray) connector [1]

Release the following from the ECM stay [2]:

- fuel pump breather hose [3]
- fuel pump unit wire [4]

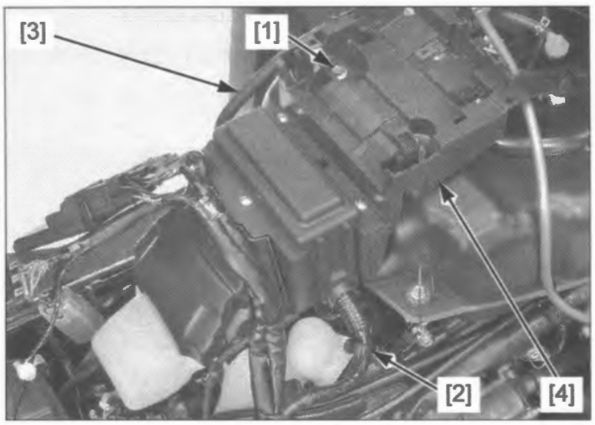
Remove the following from the ECM stay:

- wire clamp [5]
- pull back relay [6]
- joint connector 2 [7]
- PCM/ECM [8]



Remove the bolt [1] and wire clamp [2].

Release the fuel hose [3] from the ECM stay [4].



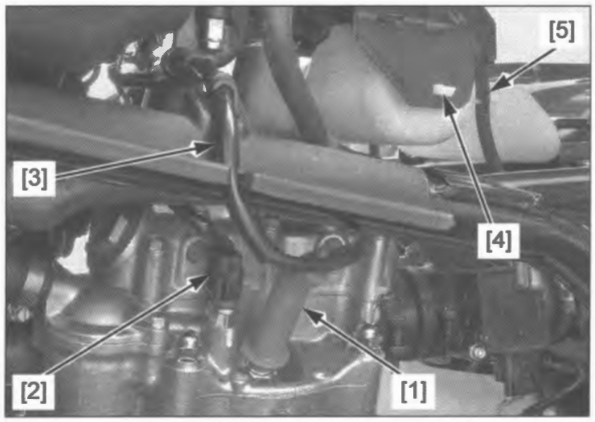
Disconnect the following:

- spark plug cap [1]
- ECT sensor 2P (Black) connector [2]

Release the following:

- spark plug wire [3] from the guides
- tab [4] from the ECM stay

FM1/FM2/FE1/FE2: Release the rear final gear case breather hose [5].

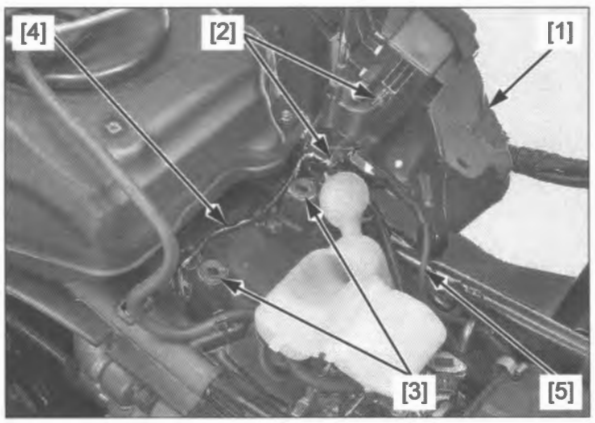


Remove the ECM stay [1] by releasing its bosses [2] from the grommets [3].

Release the ECT sensor wire [4] from the heat protector.

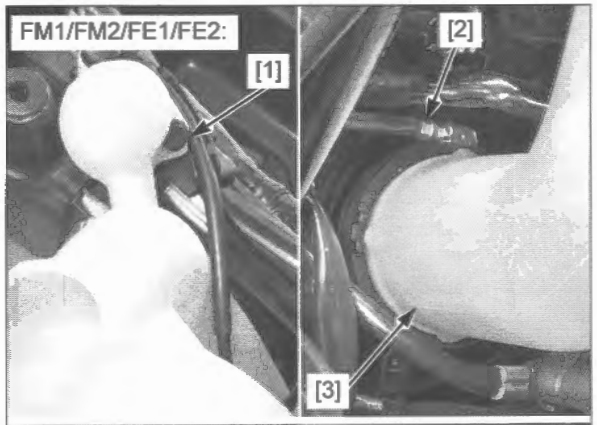
FM1/FM2/FE1/FE2: Release the brake panel breather hose [5] from the ECM stay.

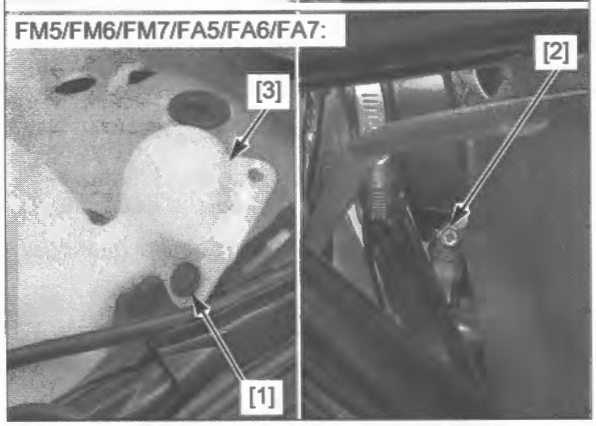
FM5/FM6/FM7/ FA5/FA6/FA7: Release the rear final gear case breather hose [5] from the ECM stay.



Remove the trim clip [1].

Loosen the screw [2] and remove the snorkel duct [3]



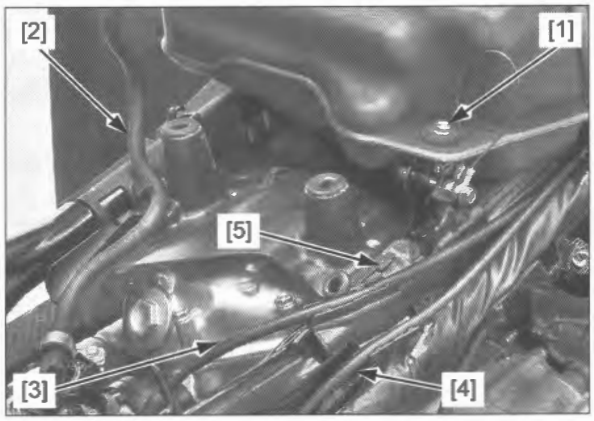


Remove the bolt [1].

Release the following from the heat protector:

- fuel hose [2]
- throttle cable [3]
- reverse lock cable [4]

Unhook the heat protector hook [5].



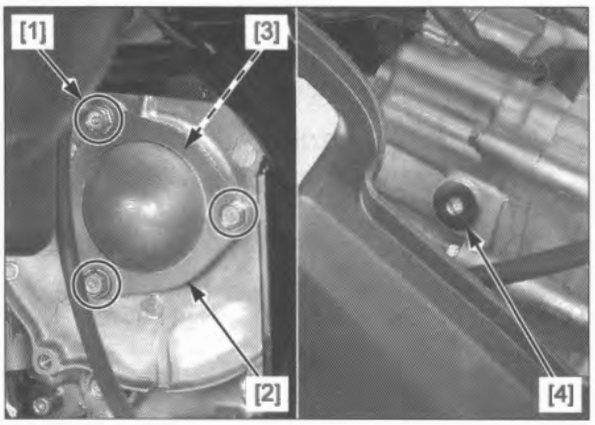
Lift the rear side of the fuel tank [1] up and support it with a suitable tool [2] as shown.

Lift the heat protector [3] up.



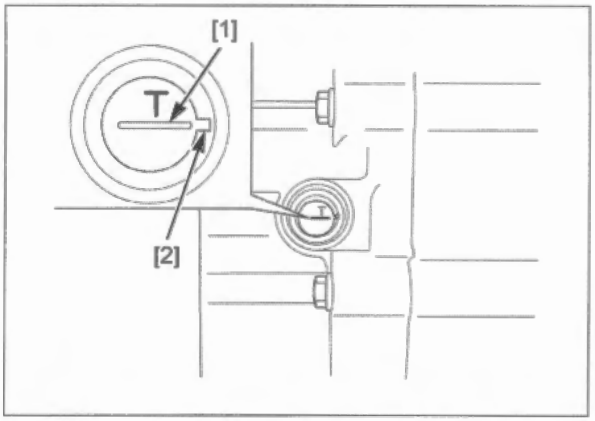
AC type: Remove the bolts [1], crankshaft hole cap [2] and O-ring [3].

Remove the timing hole cap [4].



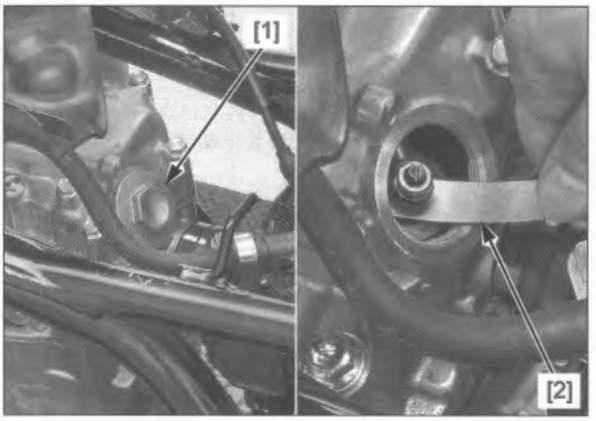
Rotate the crankshaft clockwise to align the "T" mark [1] on the flywheel with the index mark [2] on the rear crankcase cover.

- If the "T" mark is passed when trying to align it with the index mark, continue to rotate the crankshaft clockwise to align. Do not rotate the crankshaft counterclockwise. This is to prevent the one-way decompressor system from functioning, which would cause an incorrect valve clearance measurement.
- CM/ III A types: Rotate the crankshaft using the recoil starter.



Remove the valve adjusting hole caps [1].

Make sure the piston is at TDC (Top Dead Center) on the compression stroke.
This position can be obtained by confirming that there is slack in both rocker arms. If there is no slack, rotate the crankshaft clockwise one full turn and match up the "T" mark again.



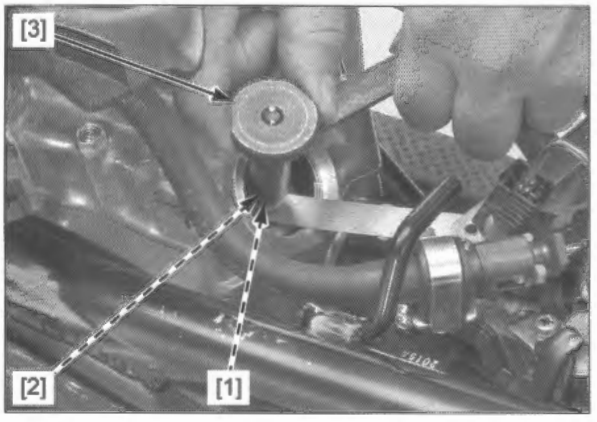
When checking the clearance, slide the feeler gauge from the center toward the outside.

Check the valve clearances by inserting a feeler gauge [2] between the adjusting screw and valve stem.

VALVE CLEARANCE:
IN: 0.15 ± 0.02 mm (0.006 ± 0.001 in)
EX: 0.23 ± 0.02 mm (0.009 ± 0.001 in)

Adjust by loosening the lock nut [1] and turning the adjusting screw [2] until there is a slight drag on the feeler gauge using the special tool.

TOOL:
[3] Tappet Adjusting Wrench Set (HEX 10)
07908-3230000



Hold the adjusting screw and tighten the lock nut to the specified torque.

TORQUE: 17 N·m (1.7 kgf·m, 13 lbf·ft)

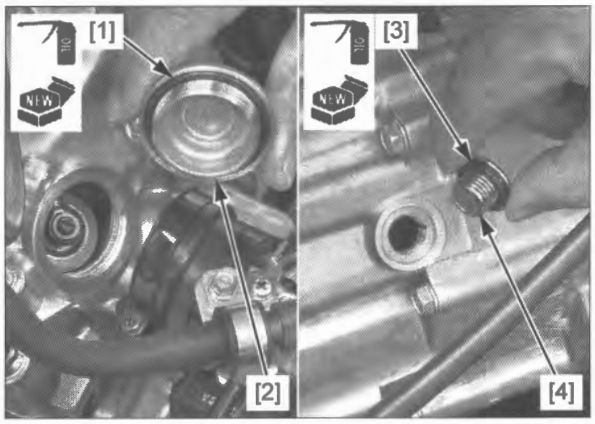
After tightening the lock nut, recheck the valve clearance.

Coat new O-rings [1] with engine oil and install them into the groove in each valve adjusting hole cap [2].
Install the valve adjusting hole caps and tighten them to the specified torque.

TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)

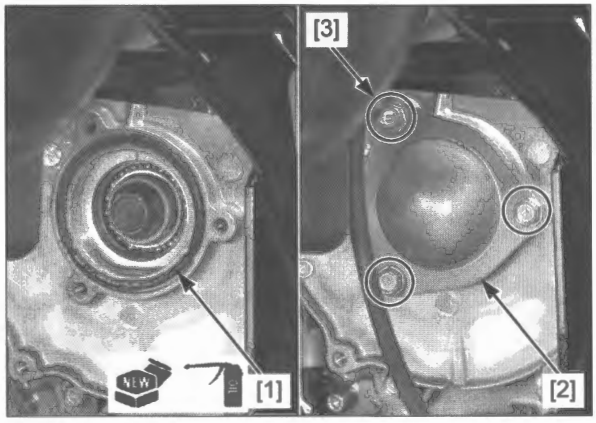
Coat a new O-ring [3] with engine oil and install it onto the timing hole cap [4].
Install the timing hole cap and tighten it to the specified torque.

TORQUE: 10 N·m (1.0 kgf·m, 7 lbf·ft)



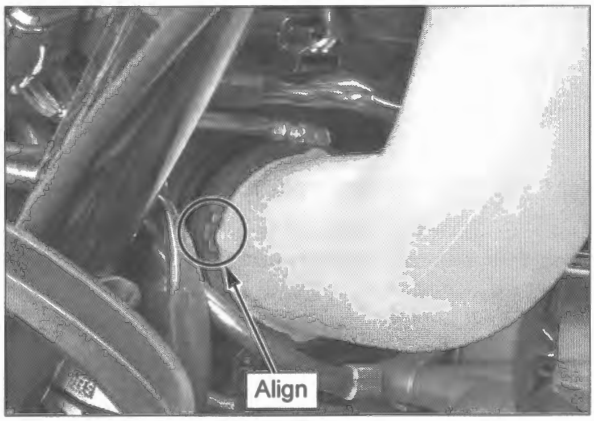
Coat a new O-ring [1] with engine oil and install it into the rear crankcase cover groove.

Install the crankshaft hole cap [2] and tighten the three bolts [3].



Install the removed parts in the reverse order of removal.

- Align the lug of the snorkel duct with the groove in the snorkel hose.
- Route the wires and hoses properly (page 1-31).



ENGINE OIL

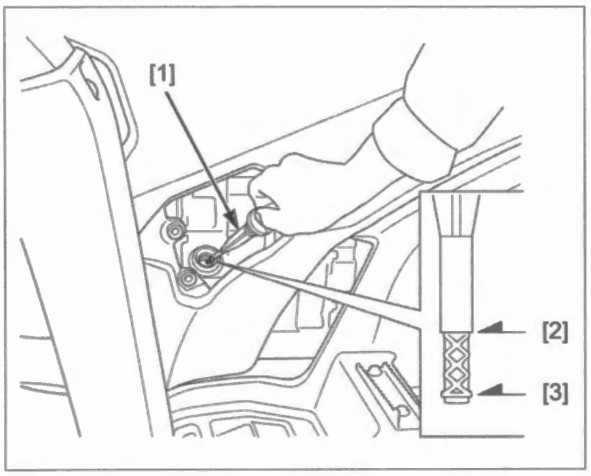
LEVEL CHECK

Remove the oil check lid (page 2-3).

Place the vehicle on level ground.

Start the engine and let it idle for 3 – 5 minutes.
If the air temperature is below 10°C (50°F), let the engine idle for an additional 5 minutes (a total of 10 minutes).
Stop the engine and wait 2 – 3 minutes.

Remove the oil filler cap/dipstick [1] and wipe it clean. Check the oil level by inserting the oil filler cap/dipstick into the engine without screwing it in.



The engine contains a sufficient amount of oil if the oil level is between the upper level [2] and lower level [3] marks on the dipstick.

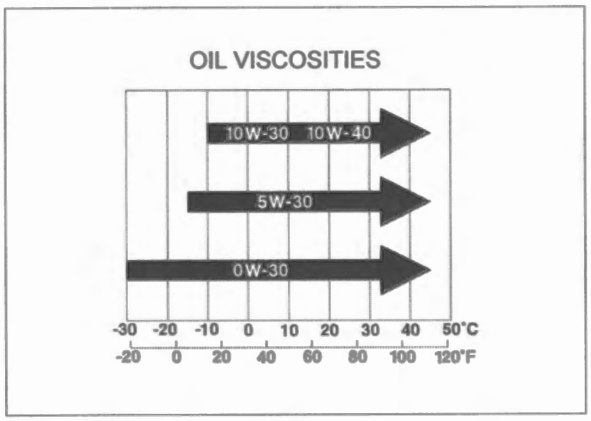
If the oil level is near or below the lower level mark, add the recommended engine oil to the upper level mark.

RECOMMENDED ENGINE OIL:

Pro Honda GN4 4-stroke oil (U.S.A. and Canada) or equivalent motorcycle oil
API service classification: SG or higher (except oils labeled as energy conserving on the circular API service label)
JASO T 903 standard: MA
Viscosity: SAE 10W-30

NOTE:

- Other viscosities shown in the chart may be used when the average temperature in your riding area is within the indicated range.



Reinstall the oil filler cap/dipstick.

Install the oil check lid (page 2-3).

OIL CHANGE

NOTE:

- Change the oil with the engine warm to assure complete and rapid draining.

Remove the oil check lid (page 2-3).

Place the vehicle on level ground.
Start the engine and let it idle for a few minutes.
Stop the engine.

Remove the drain bolt [1], sealing washer [2] and oil filler cap/dipstick [3] to drain the engine oil.

After the oil has drained, install the drain bolt with a new sealing washer and tighten it to the specified torque.

TORQUE: 25 N·m (2.5 kgf·m, 18 lbf·ft)

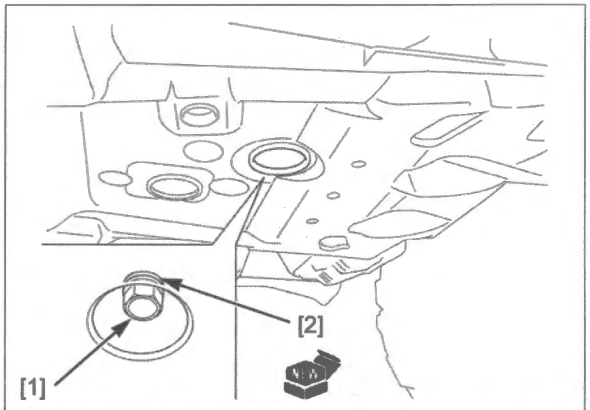
Pour the recommended oil (page 3-13) into the engine to the upper level mark on the dipstick.

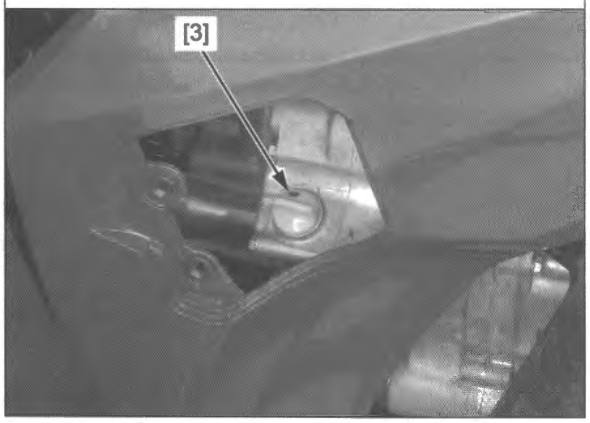
OIL CAPACITY:
FM/FE models:
After draining: 2.9 liters (3.1 US qt, 2.6 Imp qt)
After draining/filter change:
3.0 liters (3.2 US qt, 2.6 Imp qt)
After disassembly:
3.3 liters (3.5 US qt, 2.9 Imp qt)
FA models:
After draining: 3.6 liters (3.8 US qt, 3.2 Imp qt)
After draining/filter change:
3.8 liters (4.0 US qt, 3.3 Imp qt)
After disassembly:
4.4 liters (4.6 US qt, 3.8 Imp qt)

Install the oil filler cap/dipstick.

Check the oil level (page 3-13).

Reset the maintenance indicator after changing the engine oil (page 3-2).





ENGINE OIL FILTER

FM/FE models:

Remove the tank cover assembly (page 2-4).
Drain the engine oil (page 3-14).

Place shop towels under the filter cover because oil will flow out.

Remove the following:

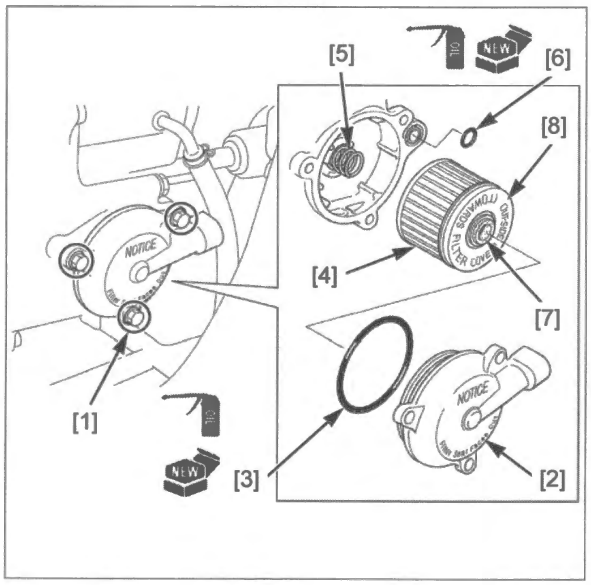
- bolts [1]
- filter cover [2] and O-ring [3]
- oil filter [4]
- setting spring [5]
- O-ring [6]

Coat new O-rings with engine oil and install them into each groove in the filter cover and front crankcase cover.

Installing the oil filter backwards will result in severe engine damage.

Install the setting spring onto the lugs and a new oil filter with the rubber seal [7] facing out, away from the engine ("OUT-SIDE" mark [8] on the filter is visible), then set the filter cover onto the filter and tighten the bolts while holding the cover.

Fill the crankcase with the engine oil (page 3-14).
Install the tank cover assembly (page 2-4).



FA models:

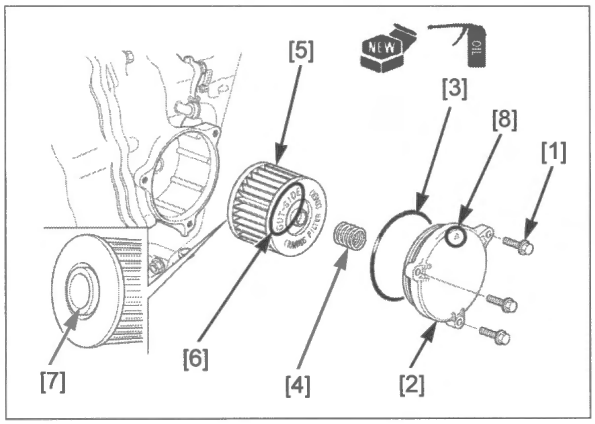
Remove the tank cover assembly (page 2-4).

Drain the engine oil (page 3-14).

Place shop towels under the filter cover because oil will flow out.

Remove the following:

- bolts [1]
- filter cover [2] and O-ring [3]
- setting spring [4]
- oil filter [5]



Coat a new O-ring with engine oil and install it into the groove in the filter cover.

Installing the oil filter backwards will result in severe engine damage.

Install a new oil filter onto the engine boss with the "OUT-SIDE" mark [6] facing out (rubber seal [7] side facing in).
Install the spring onto the filter boss, then install the filter cover with the triangular mark [8] facing up.
Tighten the bolts securely while holding the cover.

Fill the crankcase with the engine oil (page 3-14).

Install the tank cover assembly (page 2-4)

ENGINE IDLE SPEED

INSPECTION

NOTE:

- Inspect the idle speed after all other engine maintenance items have been performed and are within specifications.
- Before checking the idle speed, check the following:
  – DTC or MIL blinking (page 4-13)
  – spark plug condition (page 3-7)
  – air cleaner condition (page 3-5)
- The engine must be warm for accurate idle speed inspection.
- This system eliminates the need for manual idle speed adjustment compared to previous designs.
- Use a tachometer with graduations of 50 rpm or smaller that will accurately indicate a 50 rpm change.

Remove the tank cover assembly (page 2-4).

Start the engine and warm it up until the coolant temperature rises to 80°C (176°F).

Stop the engine and connect a tachometer according to the tachometer manufacturer's instructions.

Start the engine and let it idle. Check the idle speed.

ENGINE IDLE SPEED: 1,400 ± 100 rpm

If the idle speed is out of the specification, check the following:

- throttle operation and throttle lever freeplay (page 3-4).
- intake air leak
- engine top-end problem (page 10-3)
- IACV operation (page 7-23)

EVAPORATIVE EMISSION CONTROL SYSTEM (After '19 AC type)

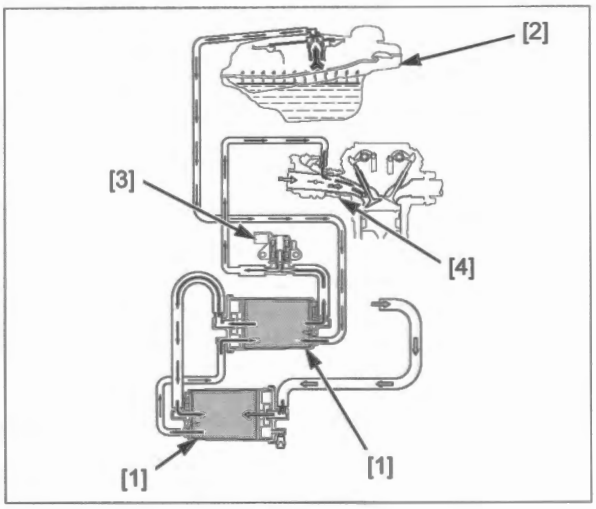
Remove the right center mudguard (page 2-5).

Check the EVAP canisters [1] for clacks or damage.

Check the hoses between the fuel tank [2], EVAP canisters, EVAP purge control solenoid valve [3] and throttle body [4] for deterioration, damage or loose connections.

Also, check that the hoses are not kinked or pinched.

Refer to the Cable & Harness Routing for hose connections and routing (page 1-31).



RADIATOR COOLANT

Check the coolant level of the reserve tank [1] with the engine running at normal operating temperature.

The level should be between the upper [2] and lower level lines [3] with the vehicle upright on a level surface.

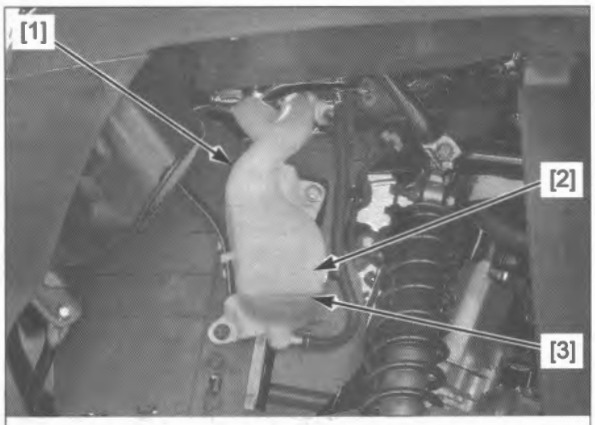
If the level is low, add coolant as follows:

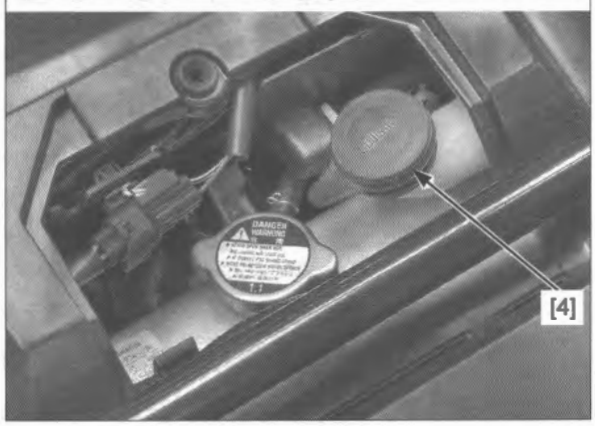
Remove the radiator cap lid (page 2-3).

Remove the reserve tank cap [4] and fill the tank up to the upper level line with a 1:1 mixture of distilled water and antifreeze.

RECOMMENDED ANTIFREEZE:

Pro Honda HP Coolant or an equivalent high quality ethylene glycol antifreeze containing corrosion protection inhibitors





NOTICE

Using coolant with silicate corrosion inhibitors may cause premature wear of water pump seals or blockage of radiator passages. Using tap water may cause engine damage.

Check to see if there are any coolant leaks when the coolant level decreases very rapidly.

If the reserve tank becomes completely empty, there is a possibility of air getting into the cooling system.
Be sure to remove any air from the cooling system (page 8-5).

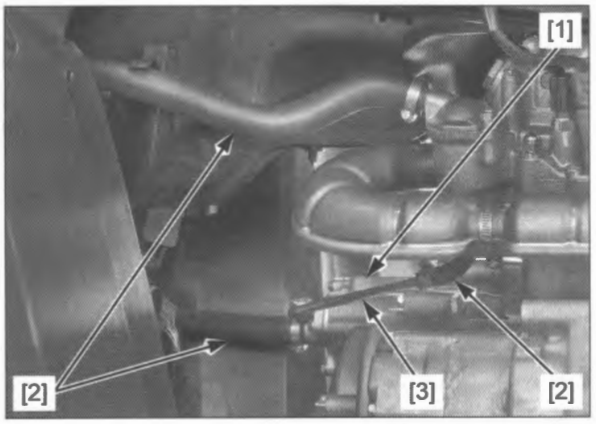
COOLING SYSTEM

NOTE:

- If the vehicle is used in very wet or muddy conditions, more frequent inspections are required.

Remove the tank cover assembly (page 2-4).

Check for any coolant leakage from the water pump [1], water hoses [2], pipe [3] and hose joints.
Check the water hoses for cracks or deterioration and replace if necessary.
Check that all hose clamps are tight.



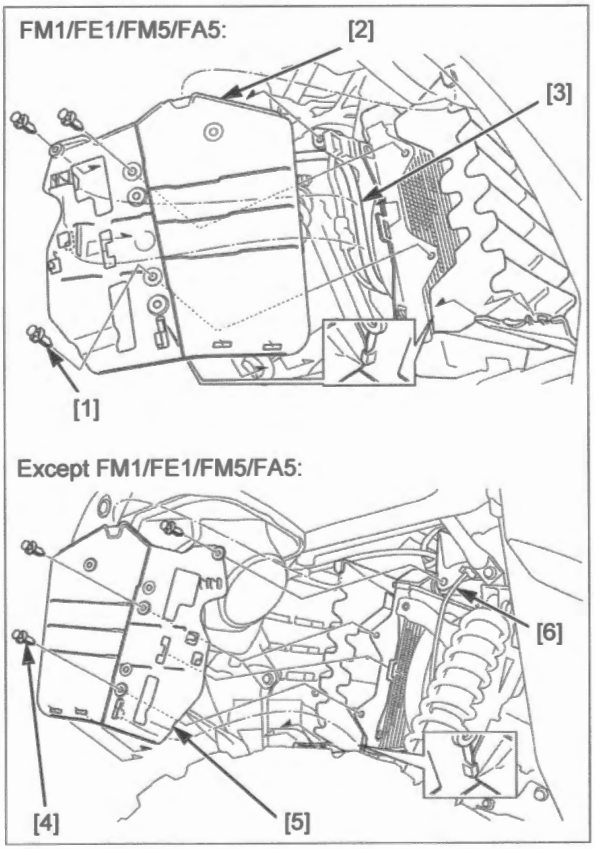
Remove the radiator reserve tank (page 8-9).

FM1/FE1/FM5/FA5: Remove the trim clips [1] and right radiator grille cover [2].

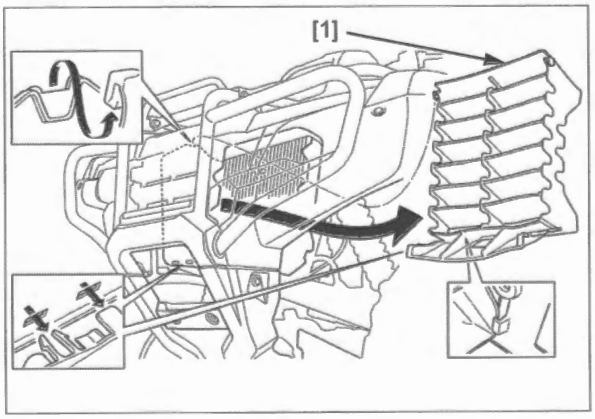
- Release the fan motor breather hose [3] from the radiator grille cover.

Except FM1/FE1/FM5/FA5: Remove the trim clips [4] and left radiator grille cover [5].

- Release the front final drive breather hose [6] from the radiator grille cover.



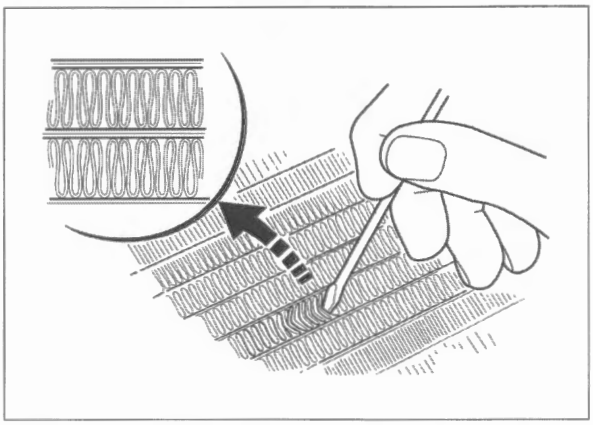
Remove the center radiator grille cover [1].



Check the radiator air passage for clogs or damage.
Straighten bent fins with a small, flat blade screwdriver and remove insects, mud or other obstructions with compressed air or low water pressure.
Also, clean the radiator grille thoroughly.
Replace the radiator if the air flow is restricted over more than 20% of the radiating surface.

Install the removed parts in the reverse order of removal.

- Route the hoses properly (page 1-31).



DRIVE TRAIN BOOTS

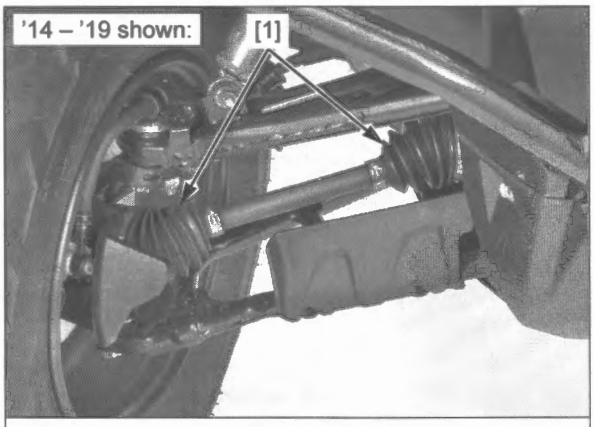
Raise all the wheels off the ground by supporting the frame securely.

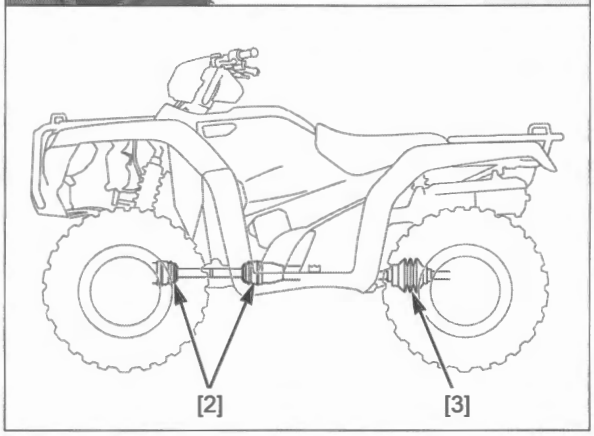
Remove the oil check lid (page 2-3).

Check the drive shaft boots [1], propeller shaft boots [2] and universal joint boot [3] for cuts, damage or leaking grease.

If the boot is damaged, replace it.

– front driving mechanism (page 21-7)
– rear driving mechanism (page 22-5)





FRONT/REAR FINAL GEAR OIL

REAR FINAL GEAR OIL (FM1/FM2/FE1/FE2)

LEVEL CHECK

Place the vehicle on level ground.

Remove the oil check bolt [1], sealing washer [2] and check that the oil flows out of the check bolt hole.

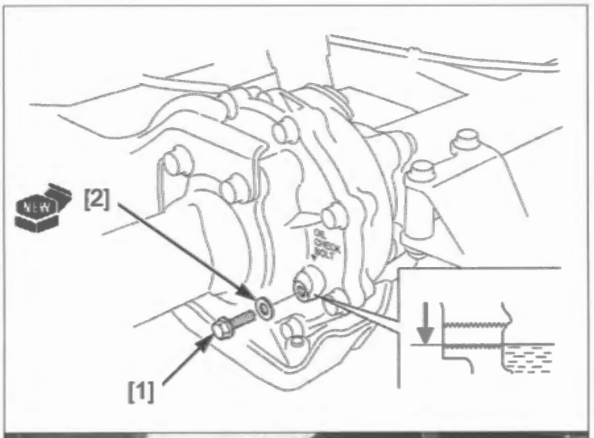
Check for leaks if there is no oil flow.

Remove the oil filler cap [3] and pour the oil slowly through the filler hole until oil starts to flow out of the check bolt hole.

RECOMMENDED OIL: Honda shaft drive oil or equivalent hypoid gear oil, SAE 80W90

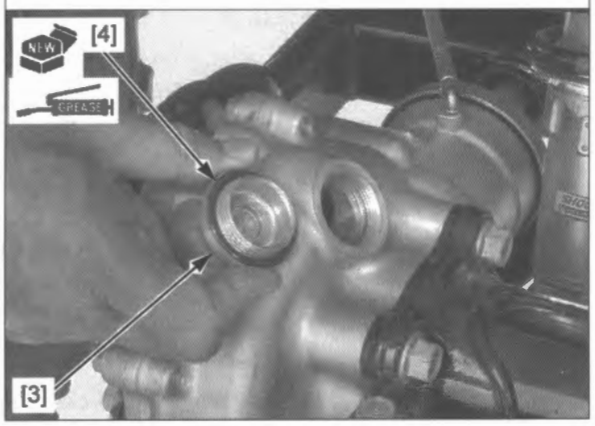
Install the check bolt with a new sealing washer and tighten it to the specified torque.

TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)



Coat a new O-ring [4] with grease and install it into the cap groove.
Install the filler cap and tighten it to the specified torque.

TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)



OIL CHANGE

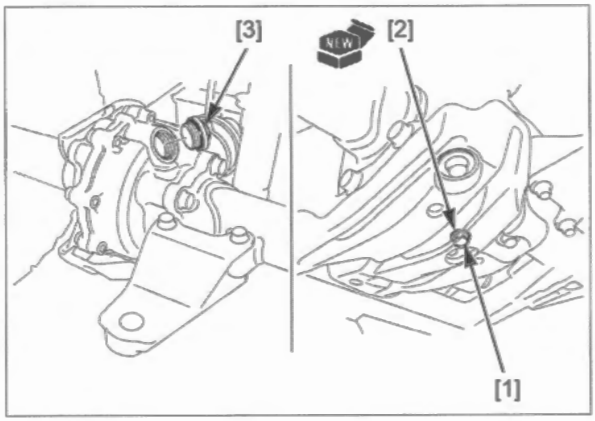
Place the vehicle on level ground.

Remove the drain bolt [1] and sealing washer [2], and the filler cap [3] to drain the oil.
When the oil is completely drained, install the drain bolt with a new sealing washer and tighten it to the specified torque.

TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)

Fill the gear case with the recommended oil (page 3-19).

OIL CAPACITY:
After draining: 85 cm³ (2.9 US oz, 3.0 Imp oz)
After disassembly: 100 cm³ (3.4 US oz, 3.5 Imp oz)



REAR FINAL GEAR OIL AND DIFFERENTIAL OIL (FM5/FM6/FM7/FA5/FA6/FA7)

LEVEL CHECK

Place the vehicle on level ground.

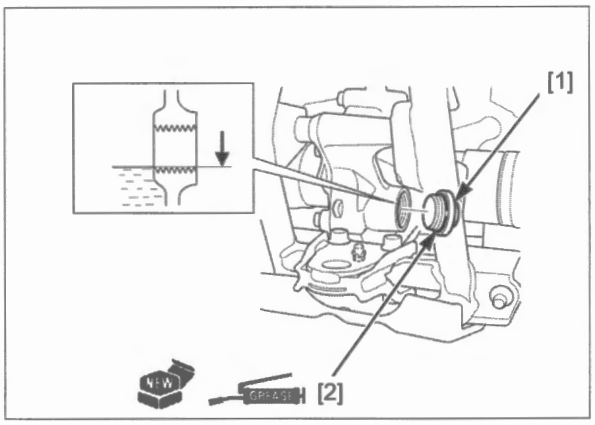
Remove the oil filler cap [1] and check that the oil level is up to the lower edge of the oil filler hole.

Check for leaks if the oil level is low.
Pour the oil into the filler hole until it reaches the lower edge of the hole.

RECOMMENDED OIL: Honda shaft drive oil or equivalent hypoid gear oil, SAE 80W90

Coat a new O-ring [2] with grease and install it into the cap groove.
Install the filler cap and tighten it to the specified torque.

TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)



OIL CHANGE

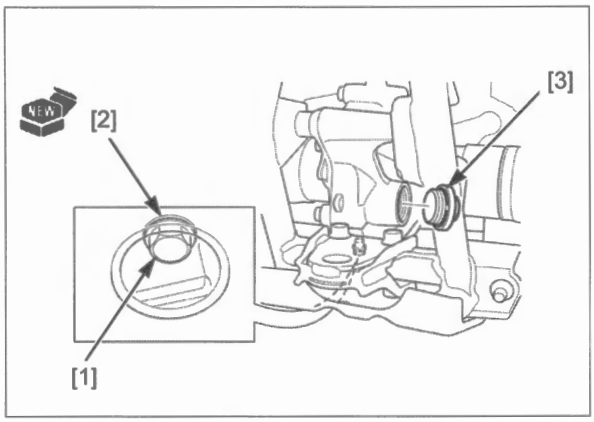
Place the vehicle on level ground.

Remove the drain bolt [1] and sealing washer [2], and the oil filler cap [3] to drain the oil.
When the oil is completely drained, install the drain bolt with a new sealing washer and tighten it to the specified torque.

TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)

Fill the gear case with the recommended oil (page 3-20).

OIL CAPACITY:
After draining: 125 cm³ (4.2 US oz, 4.4 Imp oz)
After disassembly: 145 cm³ (4.9 US oz, 5.5 Imp oz)



FRONT FINAL GEAR OIL

LEVEL CHECK

Place the vehicle on level ground.

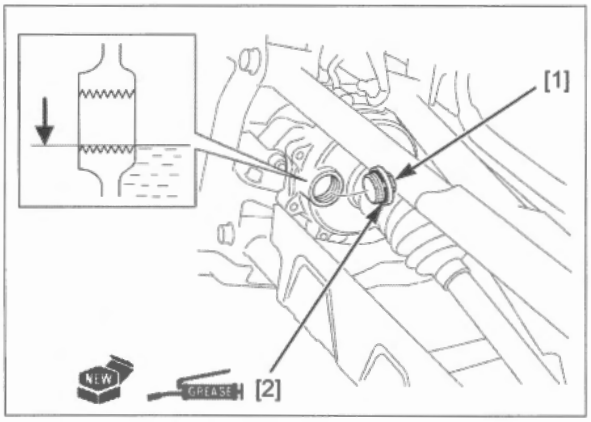
Remove the oil filler cap [1] and check that the oil level is up to the lower edge of the oil filler hole.

Check for leaks if the oil level is low.
Pour the oil into the filler hole until it reaches the lower edge of the hole.

RECOMMENDED OIL: Honda shaft drive oil or equivalent hypoid gear oil, SAE 80W90

Coat a new O-ring [2] with grease and install it into the cap groove.
Install the filler cap and tighten it to the specified torque.

TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)



OIL CHANGE

Place the vehicle on level ground.

Remove the drain bolt [1] and sealing washer [2], and the oil filler cap [3] to drain the oil.
When the oil is completely drained, install the drain bolt with a new sealing washer and tighten it to the specified torque.

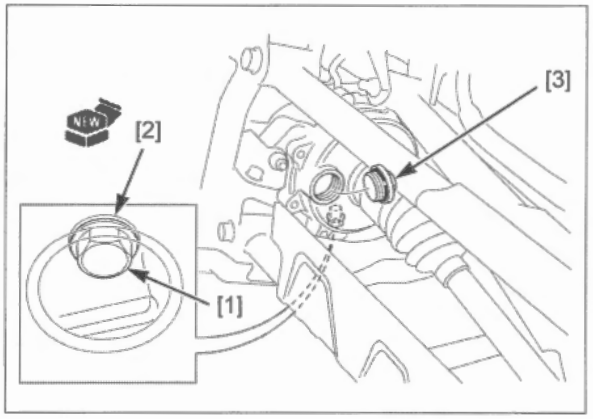
TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)

Fill the gear case with the recommended oil (page 3-21).

OIL CAPACITY:

After draining: 325 cm³ (11.0 US oz, 11.4 Imp oz)

After disassembly:
370 cm³ (12.5 US oz, 13.0 Imp oz)

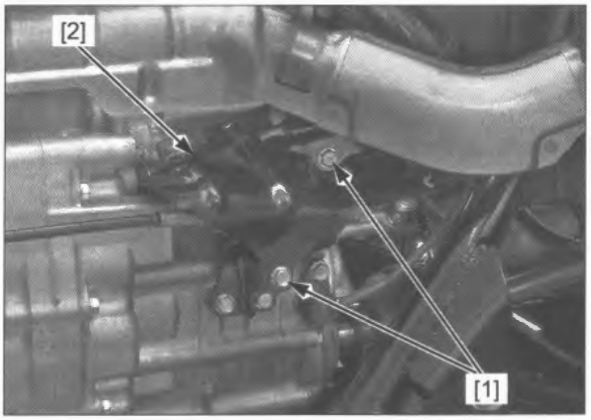


RANGE SELECT SYSTEM (FA models)

RANGE SELECT CABLE ADJUSTMENT

Remove the left center mudguard (page 2-5).

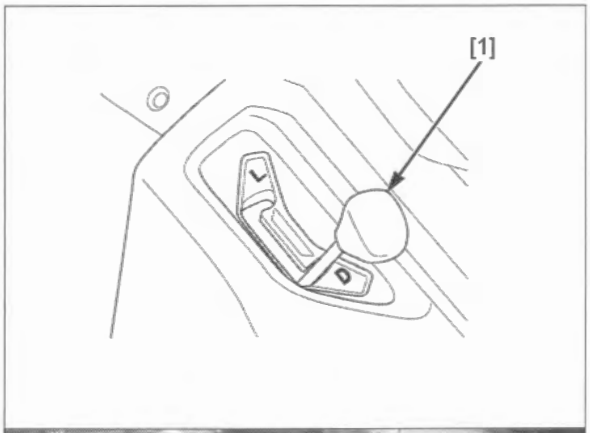
Remove the bolts [1] and range select cable cover [2].

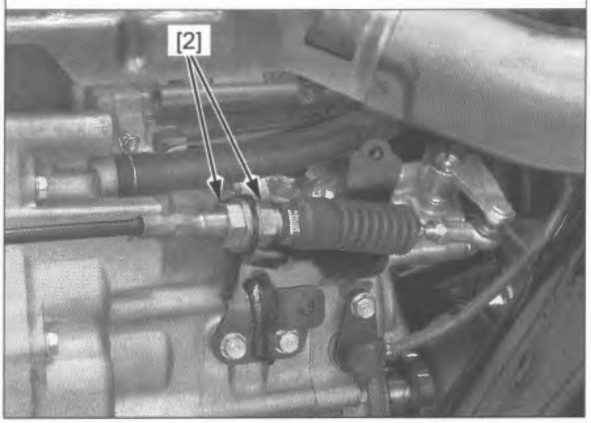


Shift the range select lever [1] to the Drive position.

Ensure vehicle is in Drive by rocking it back and forth.

Loosen the range select cable lock nuts [2] completely.



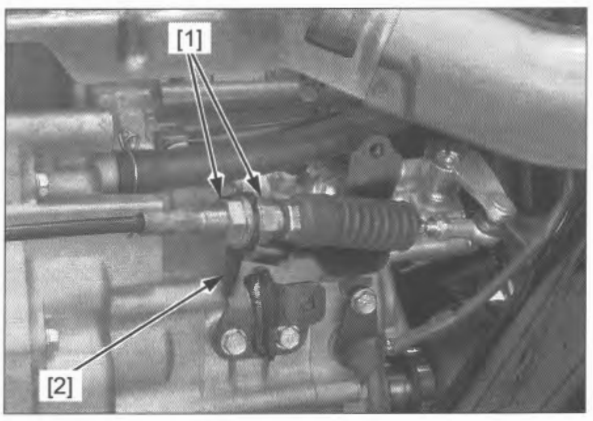


Screw the range select cable lock nuts [1] together gradually (move both nuts to the cable bracket [2] side) by your hands so that the cable is not forced until they are seated on the bracket, then tighten them to the specified torque.

TORQUE: 26 N·m (2.7 kgf·m, 19 lbf·ft)

After adjustment, check the select lever for smooth operation.

Install the removed parts in the reverse order of removal.



BRAKE FLUID

NOTICE

Spilled fluid can damage painted, plastic or rubber parts. Place a shop towel over these parts whenever the system is serviced.

NOTE:

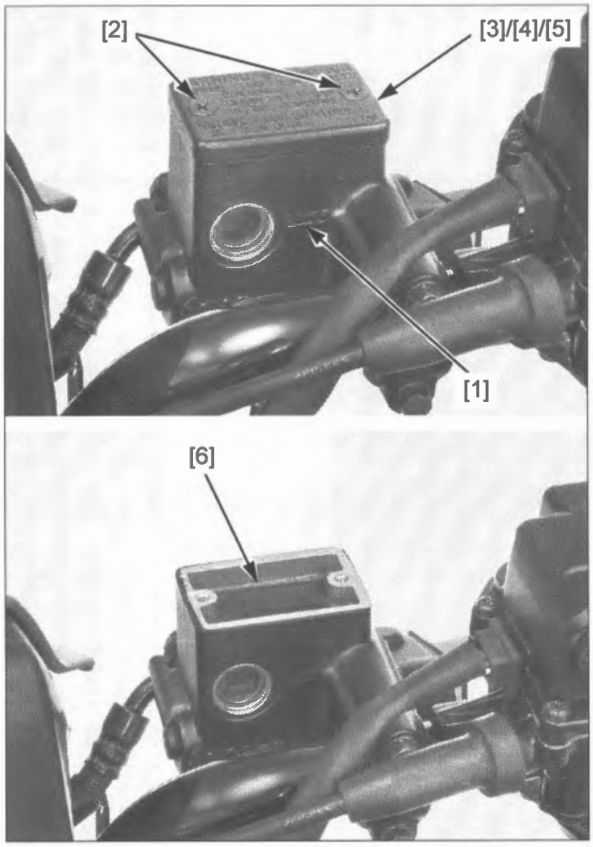
- Do not mix different types of fluid, as they may not be compatible with each other.
- Do not allow foreign material to enter the system when filling the reservoir.
- When the fluid level is low, check the brake pads for wear (page 3-24). A low fluid level may be due to wear of the brake pads. If the brake pads are worn and the caliper pistons are pushed out, this accounts for a low reservoir level.
- If the brake pads are not worn and the fluid level is low, check the entire system for leaks (page 3-25).

Turn the handlebar so the reservoir is level and check the reservoir fluid level through the sight glass.

If the fluid level is near the "LOWER" level mark [1], remove the screws [2], reservoir cap [3], set plate [4] and diaphragm [5] and fill the reservoir with DOT 4 brake fluid from a sealed container to the casting ledge [6].

Install the diaphragm, set plate and reservoir cap, and tighten the cap screws to the specified torque.

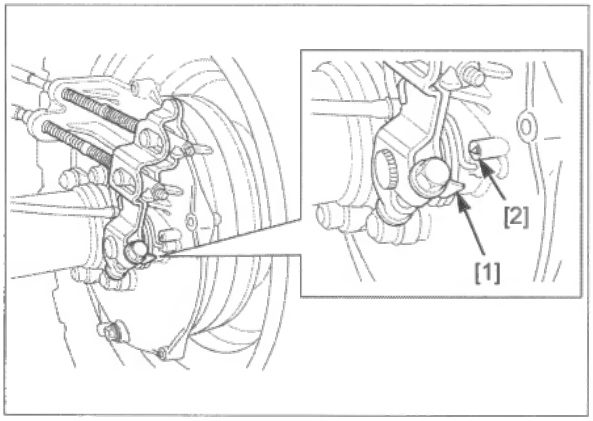
TORQUE: 2.0 N·m (0.2 kgf·m, 1.5 lbf·ft)



BRAKE SHOES WEAR (FM1/FM2/FE1/FE2)

Replace the brake shoes if the wear indicator plate [1] aligns with the reference mark [2] on the brake panel when the rear brake lever or brake pedal is applied.

See Brake System section for brake shoe replacement (page 20-16).

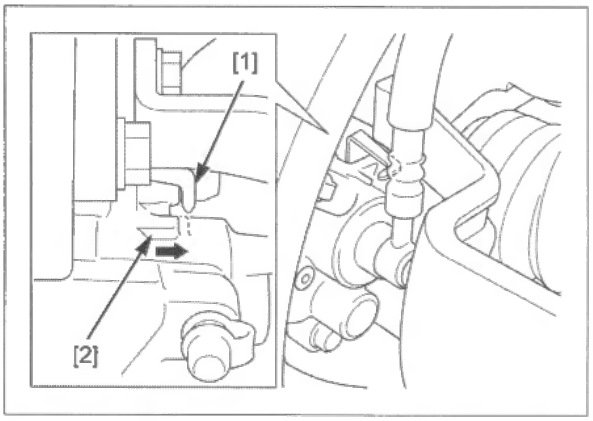


BRAKE PADS WEAR

FRONT

Replace the brake pads if the wear indicator [1] aligns with the reference mark (lug) [2] on the caliper body when the front brake is applied.

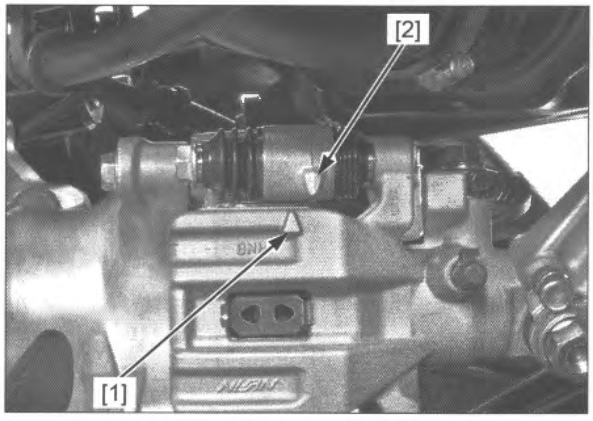
See Brake System section for brake pad replacement (page 20-10).



REAR (FM5/FM6/FM7/FA5/FA6/FA7)

Replace the brake pads if the wear limit indicator mark [1] on the caliper aligns with the reference mark [2] on the caliper bracket when the brake is applied.

See Brake System section for brake pad replacement (page 20-11).



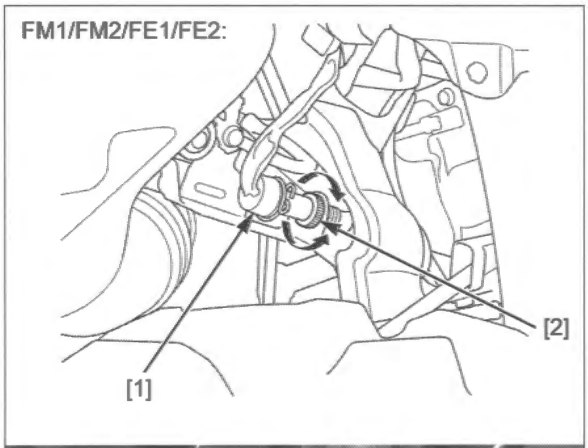
BRAKE LIGHT SWITCH

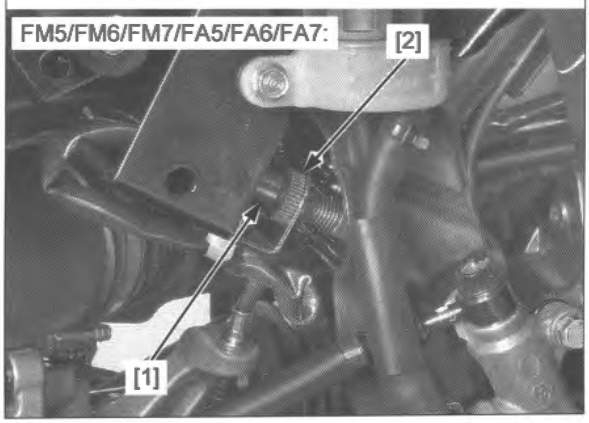
NOTE:

- The front brake light switch cannot be adjusted. If the front brake light switch actuation and brake engagement are out of synchronization, either replace the switch unit or the malfunctioning parts of the system.

Check that the brake light comes on just prior to the brake actually being engaged.

If the light fails to come on, adjust the rear brake light switch [1] so that the light comes on at the proper time. Hold the switch body and turn the adjusting nut [2]. Do not turn the switch body.



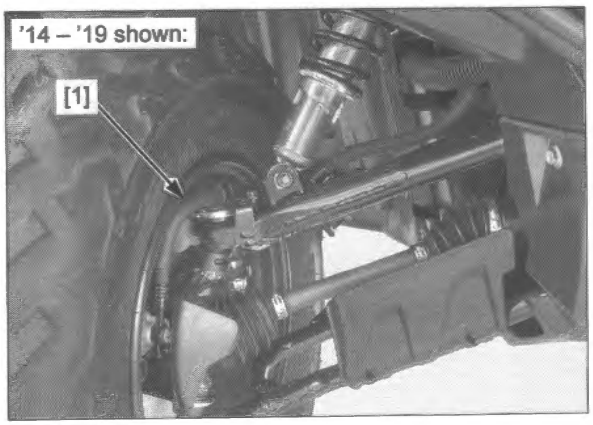


BRAKE SYSTEM

FRONT BRAKE

Firmly apply the front brake lever and check that no air has entered the system.
If the brake lever feels soft or spongy when operated, bleed the system.
See Brake System section for air bleeding procedures (page 20-8).

Inspect the brake hoses [1] and fittings for deterioration, cracks, damage or signs of leakage.
Tighten any loose fittings.
Replace hoses, pipes and fittings as required.



REAR BRAKE (FM1/FM2/FE1/FE2)

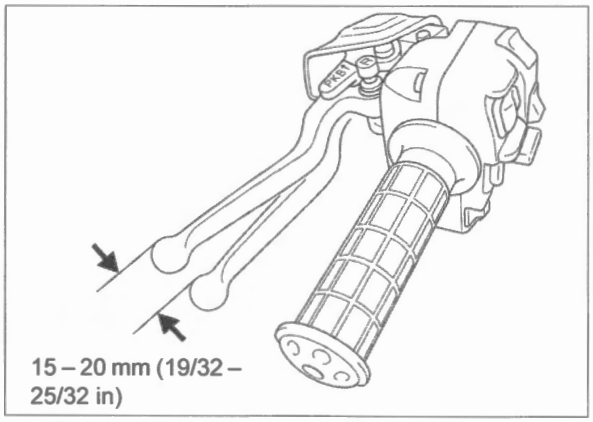
Make sure the brake pedal operates smoothly and that the brake pedal position is correct. Make sure the brakes do not drag.

Check the brake cable, brake lever and brake pedal for loose connections, excessive play or other damage. Replace or repair if necessary.

For cable lubrication: Disconnect the brake cable at the brake lever or pedal. Thoroughly lubricate the cables and their pivot points with a commercially available cable lubricant or a lightweight oil.

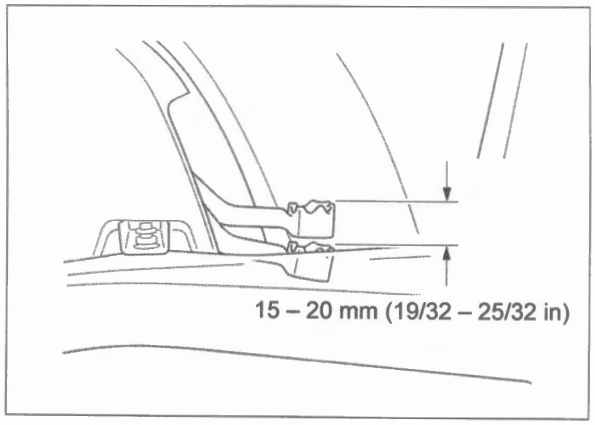
Measure the rear brake lever freeplay at the end of the lever.

FREEPLAY: 15 – 20 mm (19/32 – 25/32 in)



Measure the rear brake pedal freeplay at the end of the pedal.

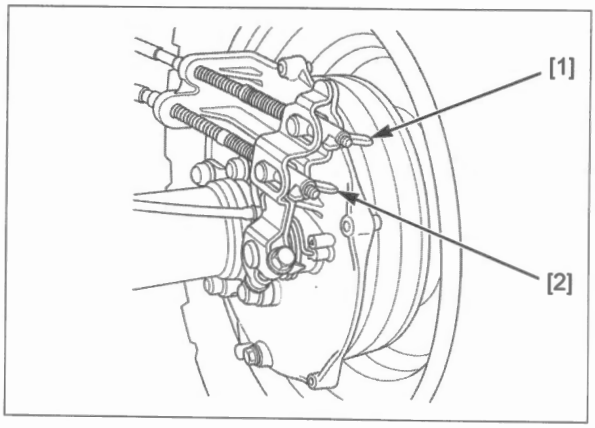
FREEPLAY: 15 – 20 mm (19/32 – 25/32 in)



Make sure the indent in the adjusting nut is seated on the brake arm pin.

Adjust the brake lever freeplay by turning the upper adjusting nut [1] at the brake arm.

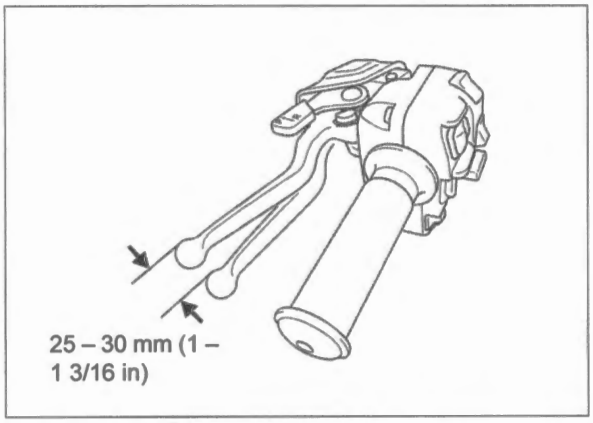
Adjust the brake pedal freeplay by turning the lower adjusting nut [2] at the brake arm.



PARKING BRAKE (FM5/FM6/FM7/FA5/FA6/FA7)

Measure the rear brake lever freeplay at the end of the lever.

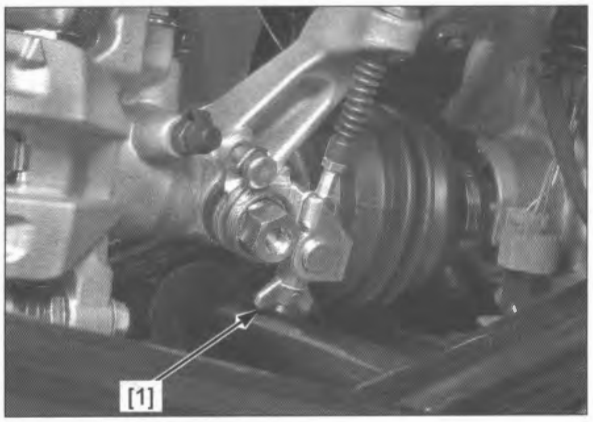
FREEPLAY: 25 – 30 mm (1 – 1 3/16 in)



Make sure the cutout in the adjusting nut is seated on the joint pin.

Adjust the brake lever freeplay by turning the adjusting nut [1].

Release the parking brake lever, and check that the brakes do not drag when the rear wheels are turned. Readjust if necessary.



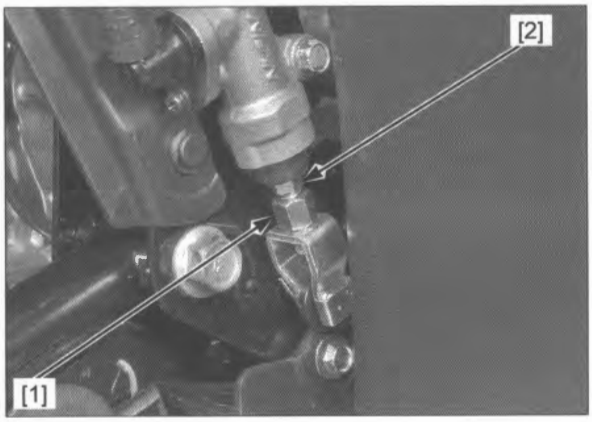
BRAKE PEDAL HEIGHT ADJUSTMENT (FM5/FM6/FM7/FA5/FA6/FA7)

Loosen the lock nut [1] and turn the push rod [2] until the correct pedal height is obtained.

For standard push rod length (page 20-21).

After adjustment, tighten the push rod lock nut to the specified torque.

TORQUE: 17 N·m (1.7 kgf·m, 13 lbf·ft)

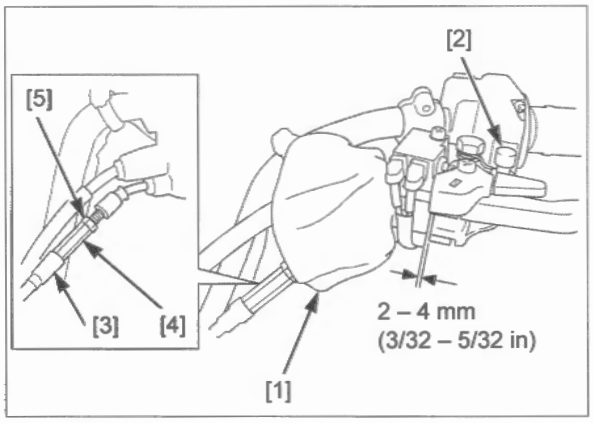


REVERSE INHIBITOR SYSTEM

FM1/FM2/FE1/FE2 ('14)

Check the reverse selector cable and lever for loose connections, excessive play or other damage.
Replace or repair if necessary.

Release the dust cover [1].
Push and hold the reverse selector knob [2], then squeeze the rear brake lever.
Measure the lever freeplay at the lever end near the cable.



FREEPLAY: 2 – 4 mm (3/32 – 5/32 in)

NOTE:

- If necessary, watch the reverse selector arm on the rear crankcase cover to see when it moves while determining freeplay.

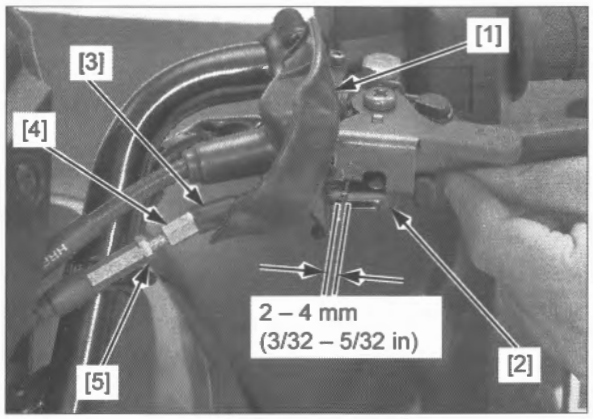
Slide the rubber boot [3] off the adjuster [4].
Adjust by loosening the lock nut [5] and turning the adjuster. Tighten the lock nut.

Install the rubber boot and dust cover properly.

FE1/FE2/FM5//FM7/FA5/FA6/FA7 ('15 – '19) and FM1/FM2/FM6 (After '15)

Check the reverse selector cable and lever for loose connections, excessive play or other damage.
Replace or repair if necessary.

Release the dust cover [1].
Move the knocker [2] by hand.
Measure the clearance (freeplay) between the knocker end and the bracket.



FREEPLAY: 2 – 4 mm (3/32 – 5/32 in)

NOTE:

- If necessary, watch the reverse selector arm on the rear crankcase cover to see when it moves while determining freeplay.

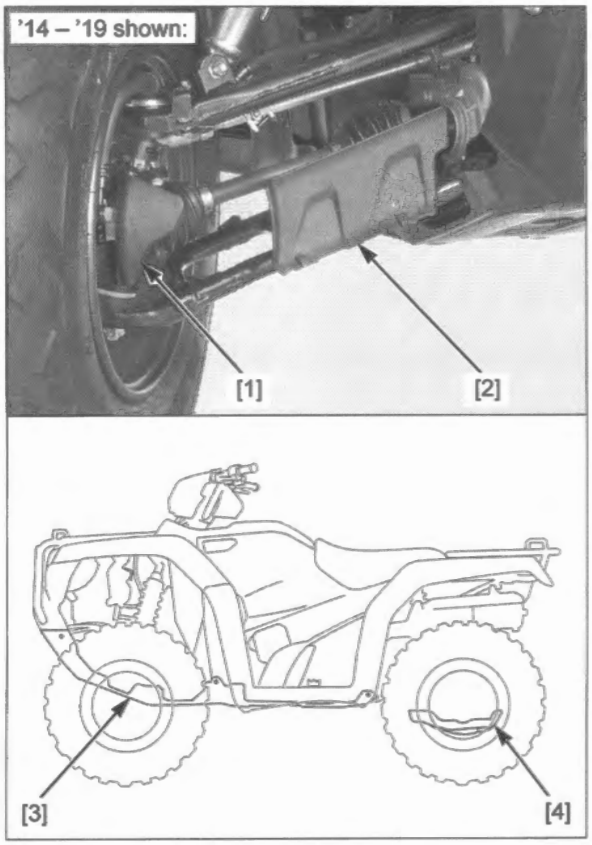
Slide the rubber boot [3] off the adjuster [4].
Adjust by loosening the lock nut [5] and turning the adjuster. Tighten the lock nut.

Install the rubber boot and dust cover properly.

GUARDS

Check the outboard guard [1], inboard guard [2], engine guard [3] and skid plate [4], for cracks, damage or looseness.

Tighten any loose fasteners. Replace the skid plates or guards as required.



CLUTCH SYSTEM (FM/FE models)

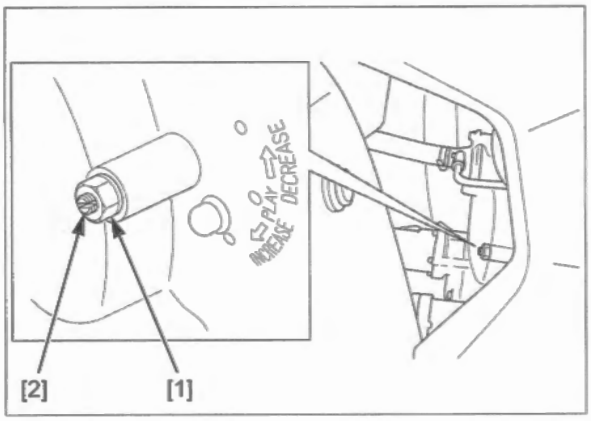
Remove the tank cover assembly (page 2-4).

Loosen the lock nut [1] and turn the adjusting screw [2] one full turn clockwise.
Slowly turn the adjusting screw counterclockwise until resistance is felt, then turn the adjusting screw 1/4 turn clockwise.

Hold the adjusting screw and tighten the lock nut.

Start the engine and check for proper clutch operation.

Install the tank cover assembly (page 2-4).



SUSPENSION

Loose, worn or damaged suspension parts impair vehicle stability and control.

Check the action of the front and rear shock absorbers by compressing them several times.
Check the entire shock absorber assembly for signs of leaks, damage or loose fasteners.
Replace damaged components which cannot be repaired.
Tighten all nuts and bolts.

FM1/FM2/FE1/FE2:

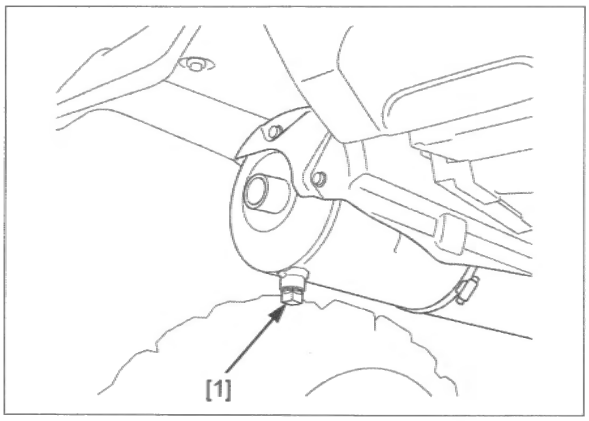
Raise the rear wheel off the ground by supporting the frame securely.
Check for worn swingarm bushings by grabbing the rear axle housing and attempting to move the wheels side to side.
Replace the swingarm if any looseness is noted (page 19-9).

SPARK ARRESTER

Remove the arrester bolt [1].

Block the end of the muffler with a shop towel.
Start the engine with the transmission in neutral, and purge accumulated carbon from the muffler by momentarily revving the engine several times.

Stop the engine and allow the exhaust system to cool.
Install the bolt and tighten it securely.



NUTS, BOLTS, FASTENERS

Check that all chassis nuts and bolts are tightened to their correct torque values (page 1-17).
Check that all cotter pins, safety clips, hose clamps and cable stays are in place and properly secured.

WHEELS/TIRES

Tire pressure should be checked when the tires are cold.

Check the tire pressure with a tire pressure gauge.

RECOMMENDED TIRE PRESSURE

Front:	**Standard:**	**30 kPa (0.30 kgf/cm², 4.4 psi)**
	With cargo:	**30 kPa (0.30 kgf/cm², 4.4 psi)**
Rear:	**Standard:**	**30 kPa (0.30 kgf/cm², 4.4 psi)**
	With cargo:	**30 kPa (0.30 kgf/cm², 4.4 psi)**

Check the tires for cuts, embedded nails, or other damage.

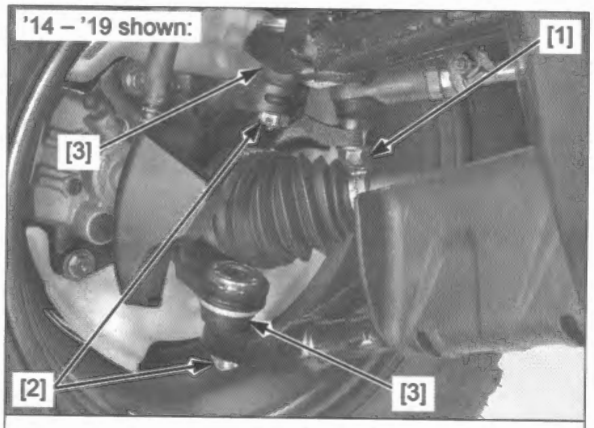
Raise the wheel off the ground and check the bearings in the knuckle for excessive play or abnormal noise.

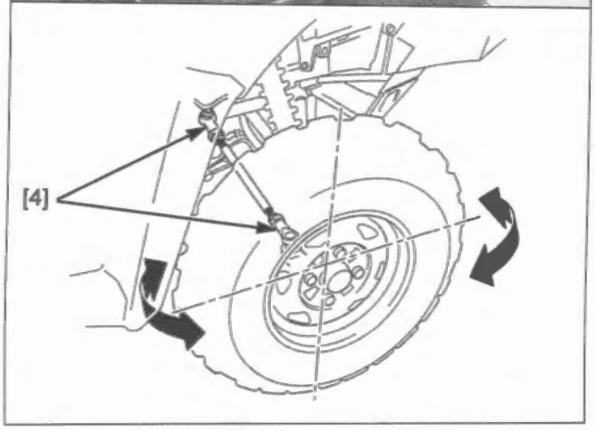
TIE-ROD AND JOINT BOOTS

Check the tie-rod joint nuts [1] and the suspension arm ball joint nuts [2] for looseness.
Check the ball joint boots [3] of the tie-rod and suspension arm for tears or other damage.
Check for looseness of the tie-rod ball joints [4] or bearings by grabbing each front wheel side to side with the wheels on the ground.

If any looseness is noted, inspect the following.

- tie-rod (page 18-33)
- knuckle bearing (page 18-14)





STEERING SHAFT HOLDER BEARING

Raise the front wheels off the ground and support the vehicle securely.

Make sure the cables do not interfere with the rotation of the handlebar.

Check that the handlebar moves freely from side to side.

FM1/FE1/FM5/FA5:

If the handlebar moves unevenly, binds, or has horizontal or vertical movement, inspect the steering shaft holder bushing and bearing (page 18-25).

Except FM1/FE1/FM5/FA5:

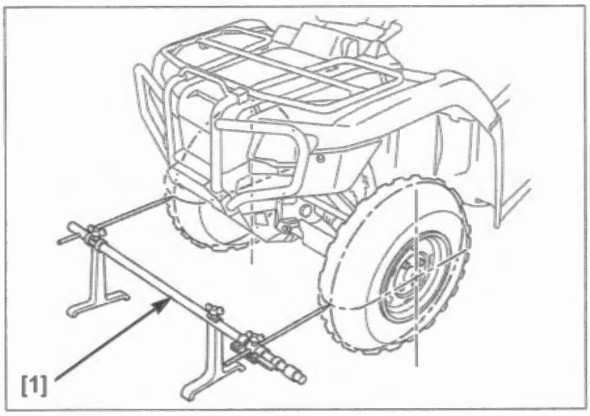
Place the vehicle on the ground.
Compare the required steering force with the engine running and with the engine stopped.

If the steering force is same, check the EPS system (page 18-28).

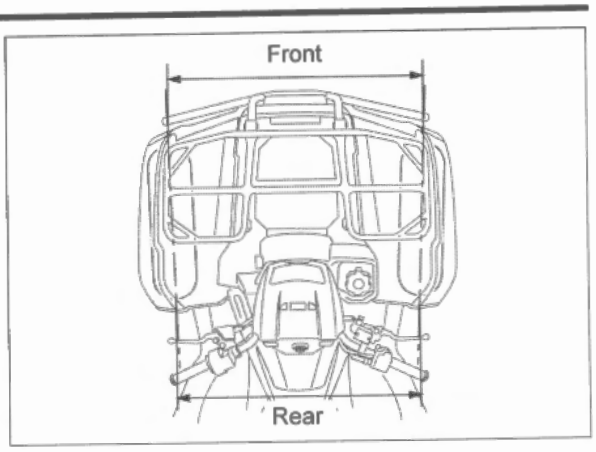
STEERING SYSTEM

Place the vehicle on level ground with the front wheels facing straight ahead.
Mark the centers of the tires with chalk to indicate the axle center height.

Align the toe-gauge [1] with the marks on the tires as shown.
Check the readings on the gauge scales.



Slowly move the vehicle back until the wheels have turned 180° so the marks on the tires are aligned with the gauge height on the rear side.
Measure the toe on the rear part of the tires at the same points with no load on the vehicle.



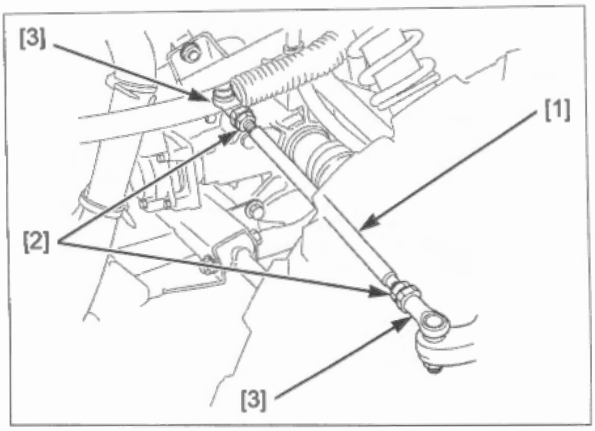
Toe-out:

'14 – '19:	**25 ± 15 mm (1.0 ± 0.6 in)**
After '19:	
FM1/FM2/FE2:	**9.0 mm (3/8 ± 19/32 in)**
FM6:	**1.0 mm (1/16 ± 19/32 in)**
FA5/FA6/FA7:	**8.0 mm (5/16 ± 19/32 in)**

NOTE:

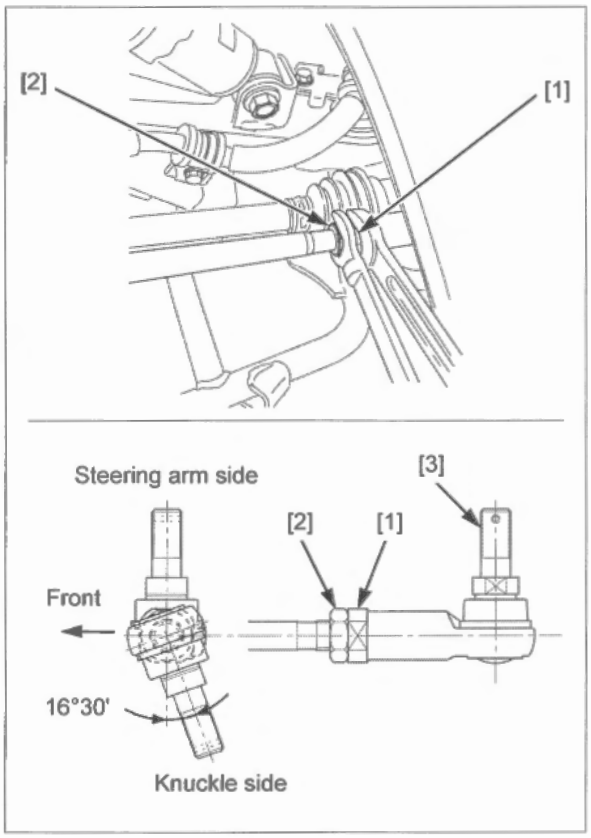
- Toe-in means the rear measurement is greater than the front measurement.
- Toe-out means the front measurement is greater than the rear measurement.

When the toe is out of specification, adjust it by changing the length of the tie-rods [1] equally by loosening the lock nuts [2] and turning the tie-rods while holding the ball joints [3].



After adjusting each tie-rod, rotate both ball joints in the same direction, along the tie-rod axis until they stop against the ball joint stud.

Using a 22 mm wrench, hold the ball joint ends (flats) [1] so that the relative angle of both ball joints may turn into specified angle. Then, tighten each lock nut [2] to the specified torque, making sure not to force the ball joint end against the ball joint stud [3].



TORQUE: 54 N·m (5.5 kgf·m, 40 lbf·ft)

After tightening the lock nuts, rotate the tie-rods to make sure the ball joints have operate properly and have an equal range of movement.

Raise the wheel off the ground and check the knuckle bearings or tie-rod ball joints for excessive play or abnormal noise.

4. PGM-FI SYSTEM

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PGM-FI SYSTEM DIAGRAM 4-7

PGM-FI TROUBLESHOOTING INFORMATION 4-12

SYMPTOM TROUBLESHOOTING 4-15

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SENSOR UNIT (MAP/TP SENSOR) 4-40

ECT SENSOR 4-43

BANK ANGLE SENSOR 4-43

IAT SENSOR 4-44

PCM/ECM 4-45

O2 SENSOR 4-47

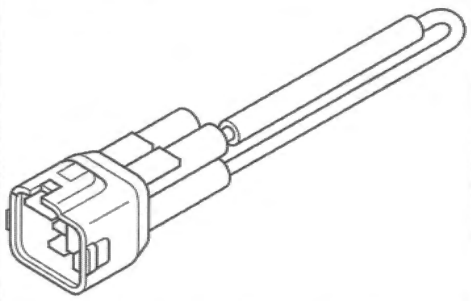
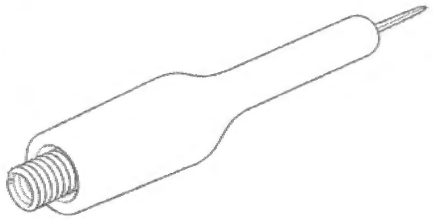
SERVICE INFORMATION

GENERAL

- This section covers service of the electrical system of the PGM-FI system. For mechanical system service of the PGM-FI system and the fuel supply system, see Fuel System section (page 7-2).
- A faulty PGM-FI system is often related to poorly connected or corroded connectors. Check those connections before proceeding.
- Use a digital tester for PGM-FI system inspection.
- The engine stop switch line is connected to the PCM/ECM on this vehicle. Its signal permits the PCM/ECM to control the fuel pump, fuel injector and ignition coil.
- The following color codes are used throughout this section.

Bl = Black	Bu = Blue	Gr = Gray	O = Orange	R = Red	W = White
Br = Brown	G = Green	Lg = Light green	P = Pink	Lb = Light blue	Y = Yellow
V = Violet					

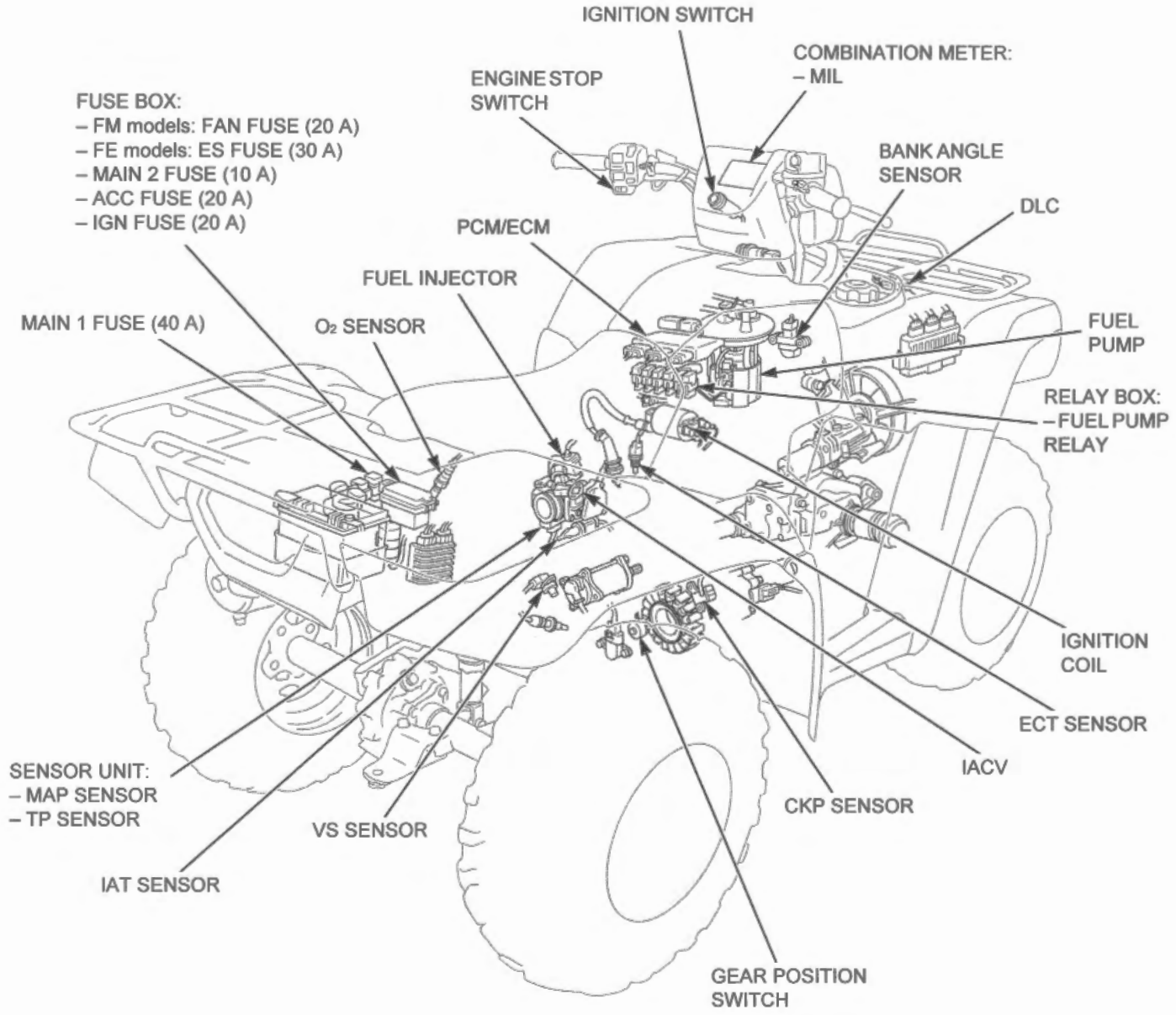
TOOLS

SCS Service Connector 070PZ-ZY30100	Pin Probe Male (2 pack) 07ZAJ-RDJA110
	

PGM-FI SYSTEM LOCATION

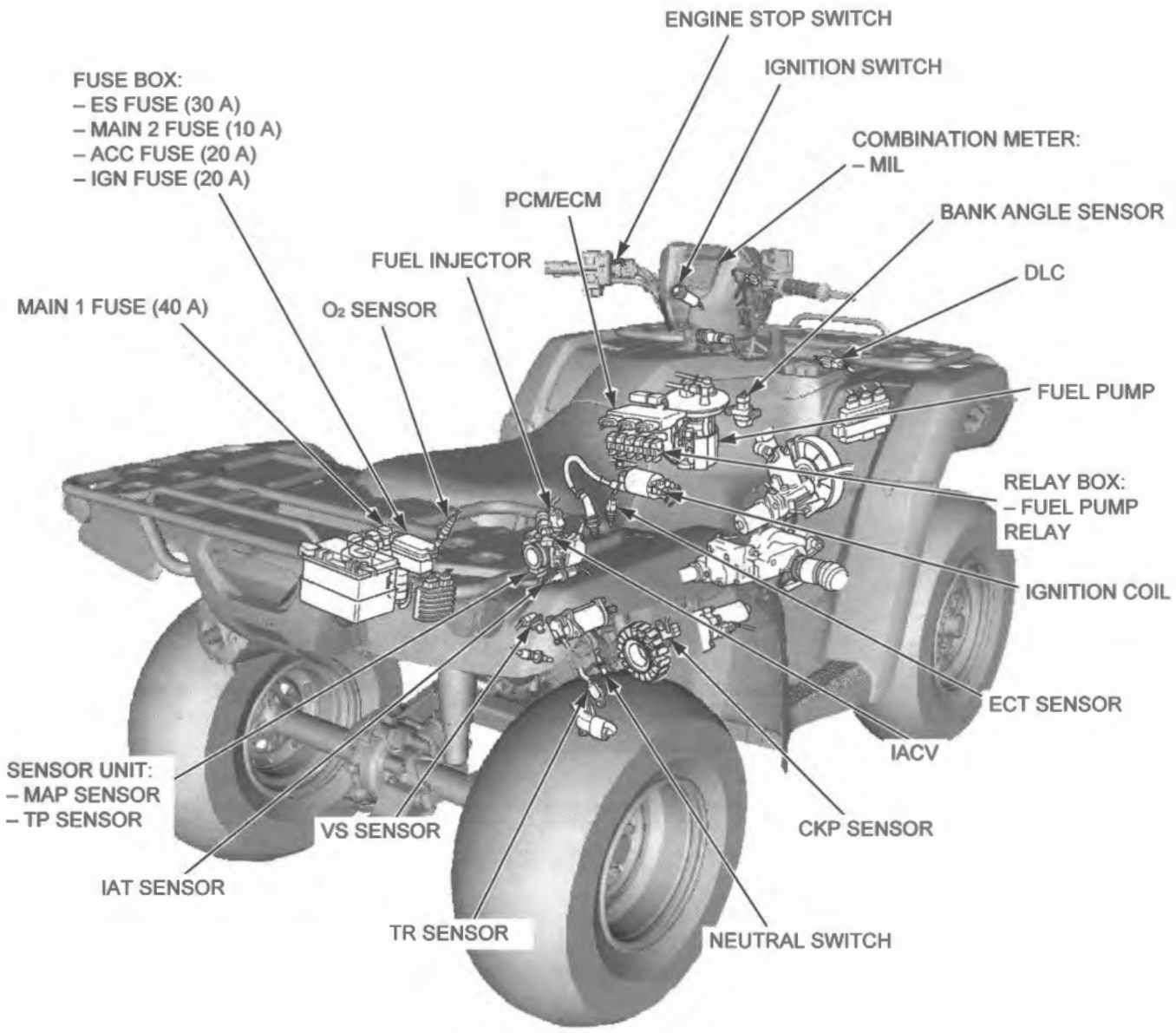
FM models (All)/FE models ('14 – '19):

'14 model shown:

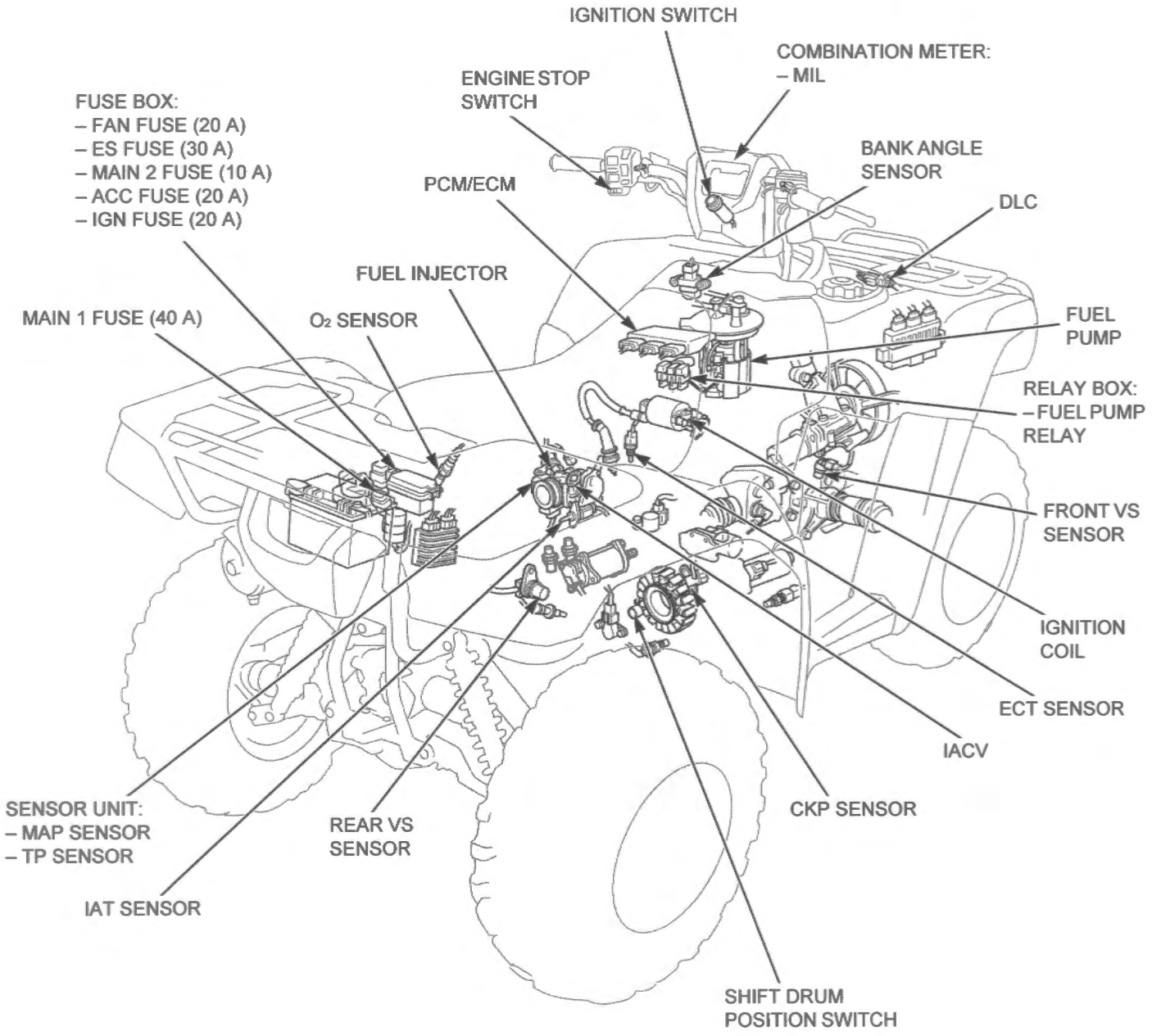


FE2 (After '19) :

'20 – '21 models shown:

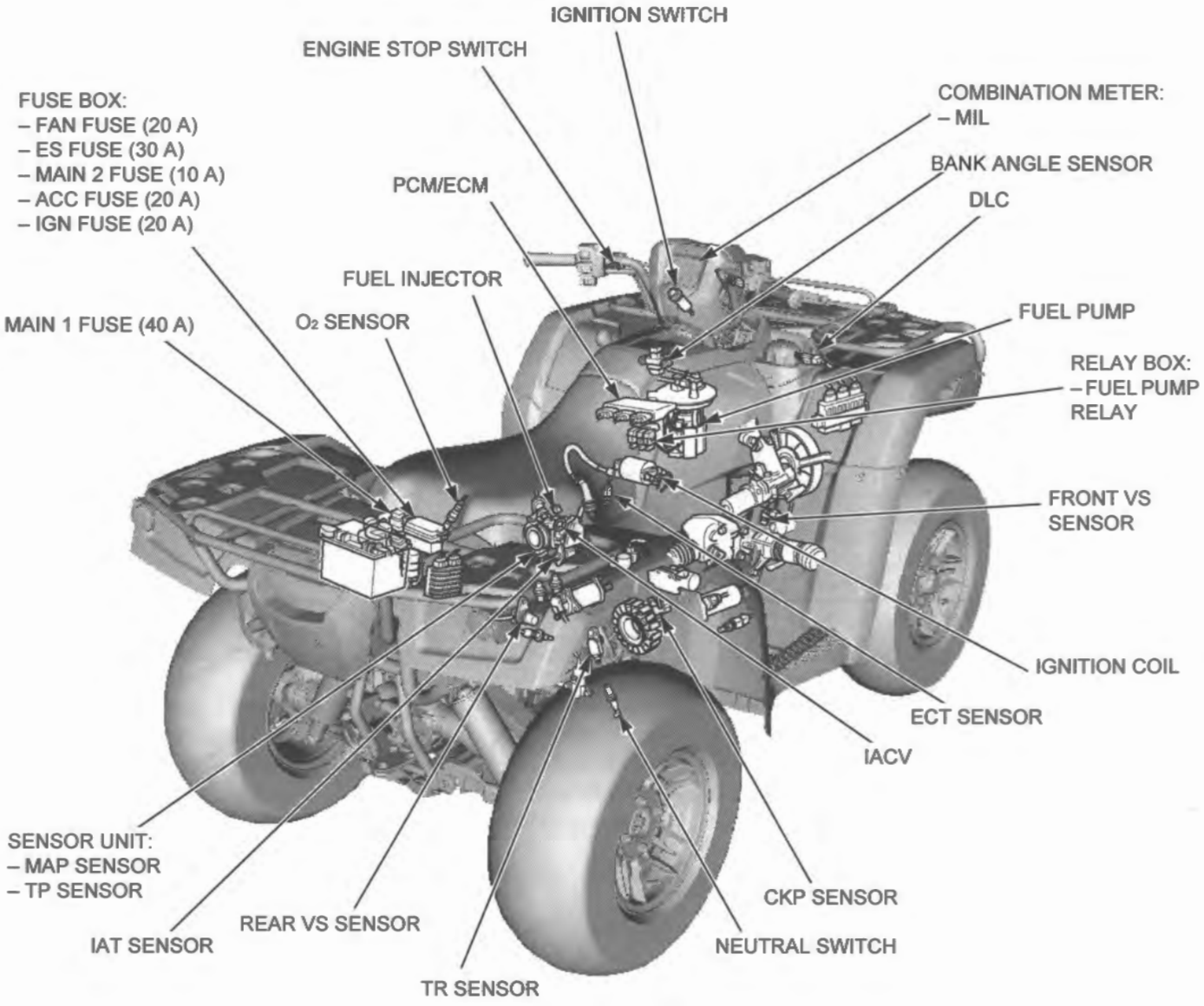


FA models ('15 – '19):



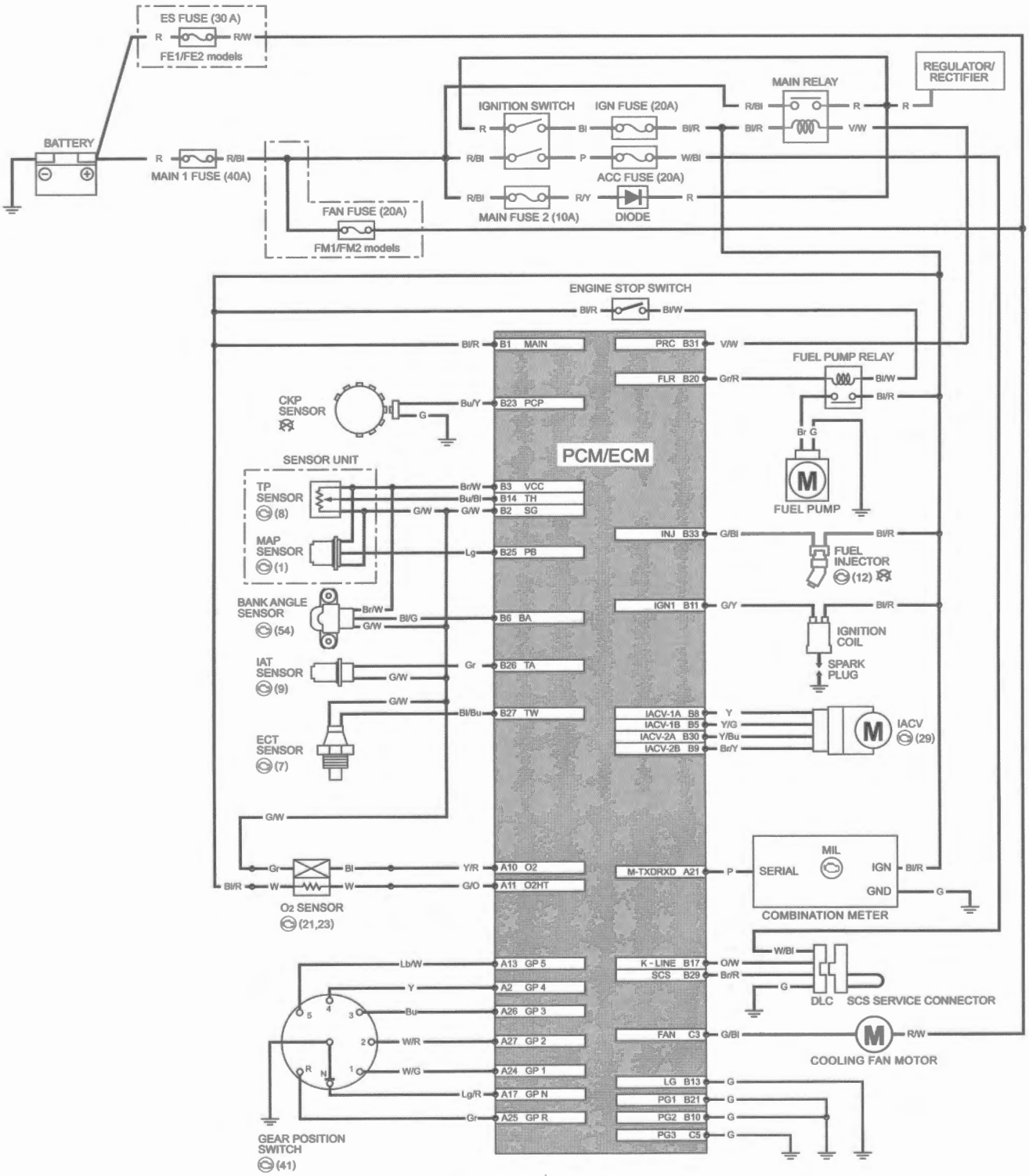
FA models (After '19):

'20 – '21 models shown:

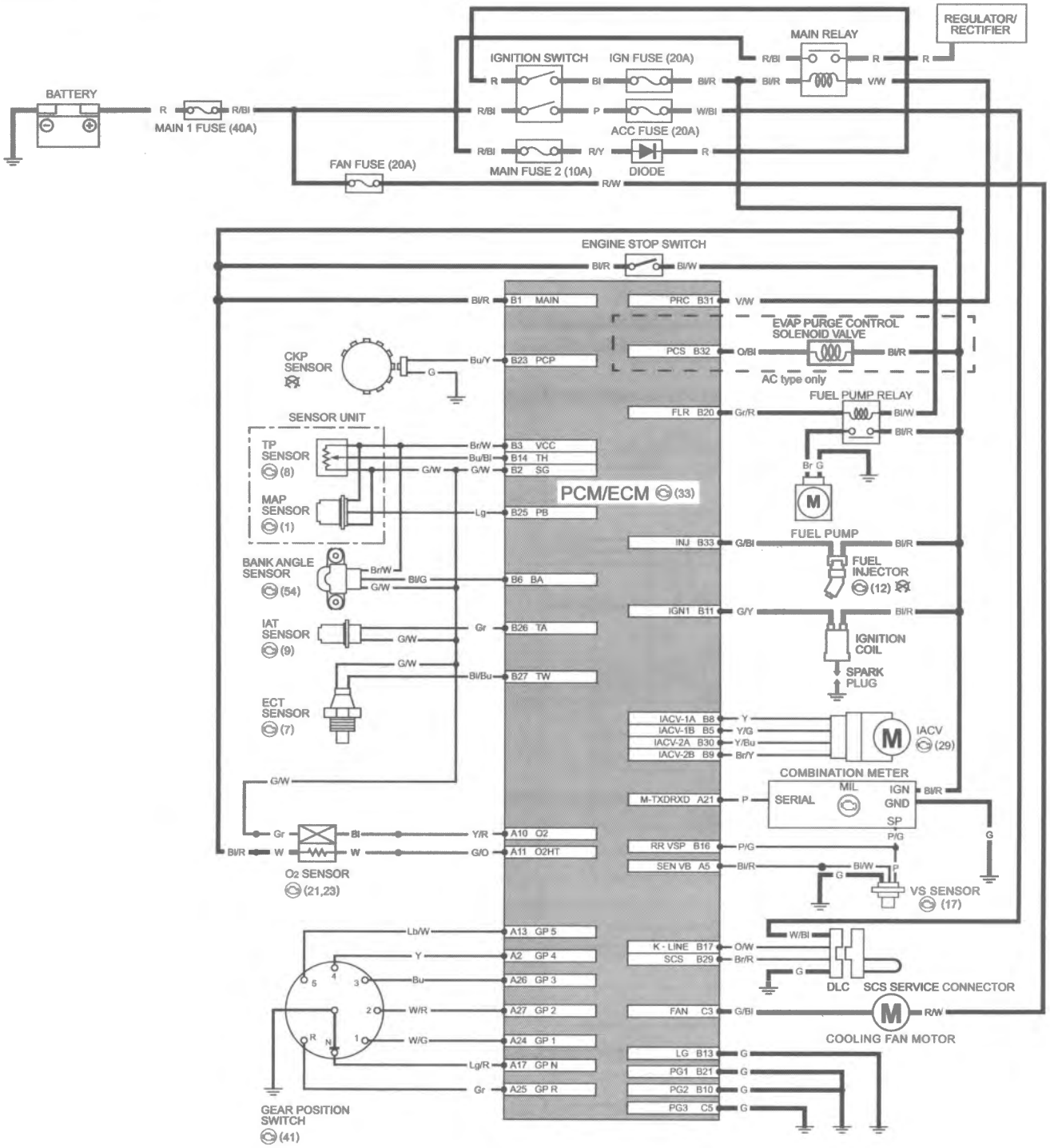


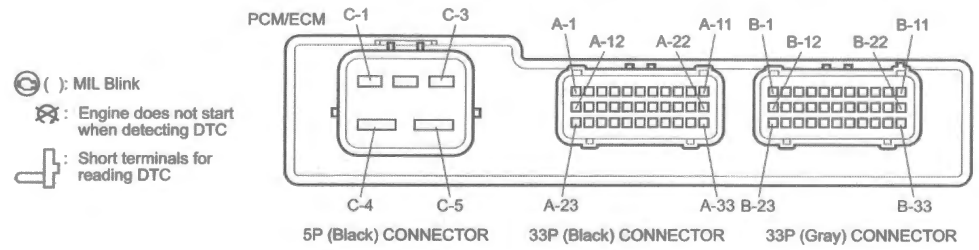
PGM-FI SYSTEM DIAGRAM

FM models ('14 – '19)/FE models ('14 – '19):



FM models (After '19):



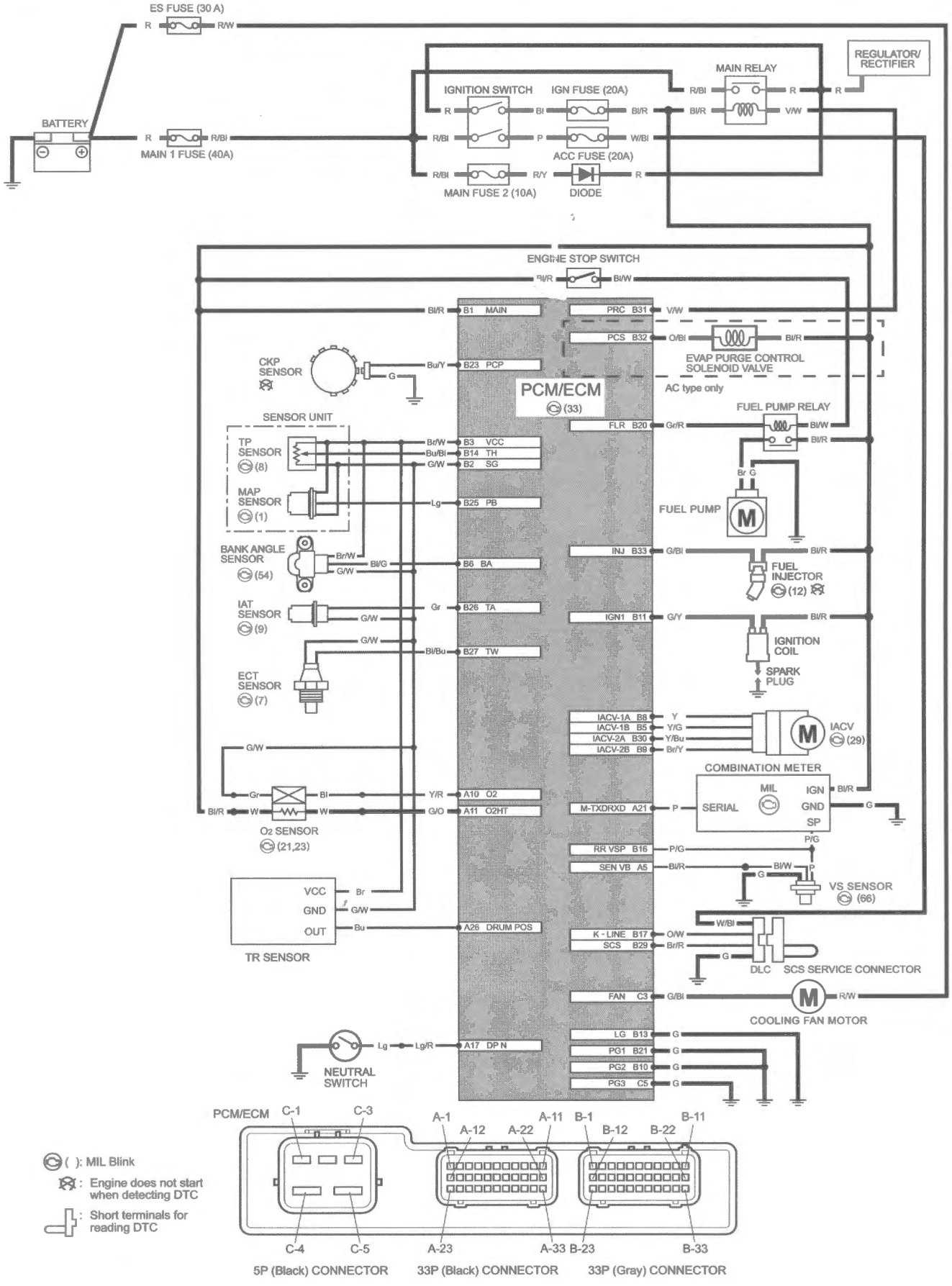


( ): MIL Blink

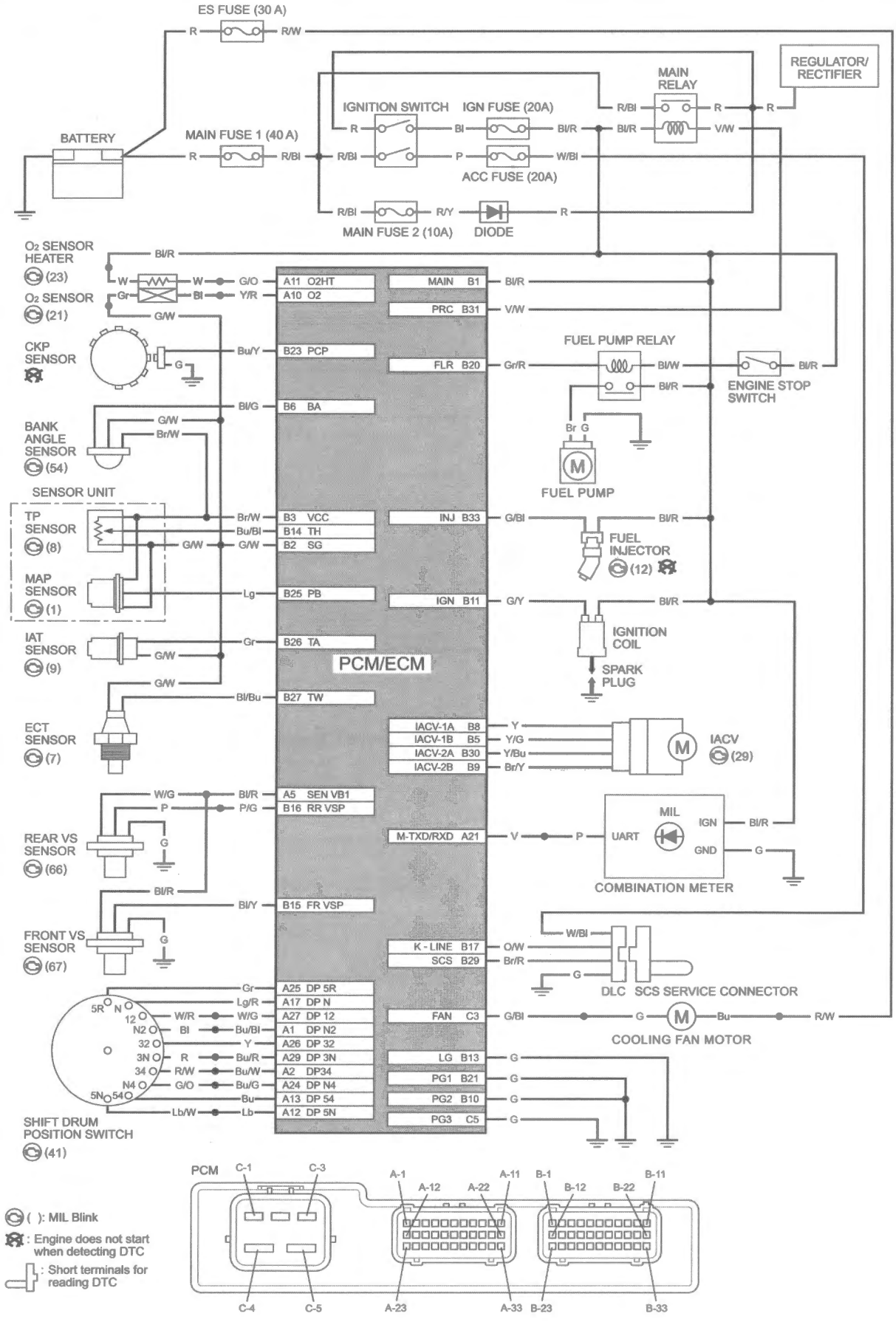
: Engine does not start when detecting DTC

: Short terminals for reading DTC

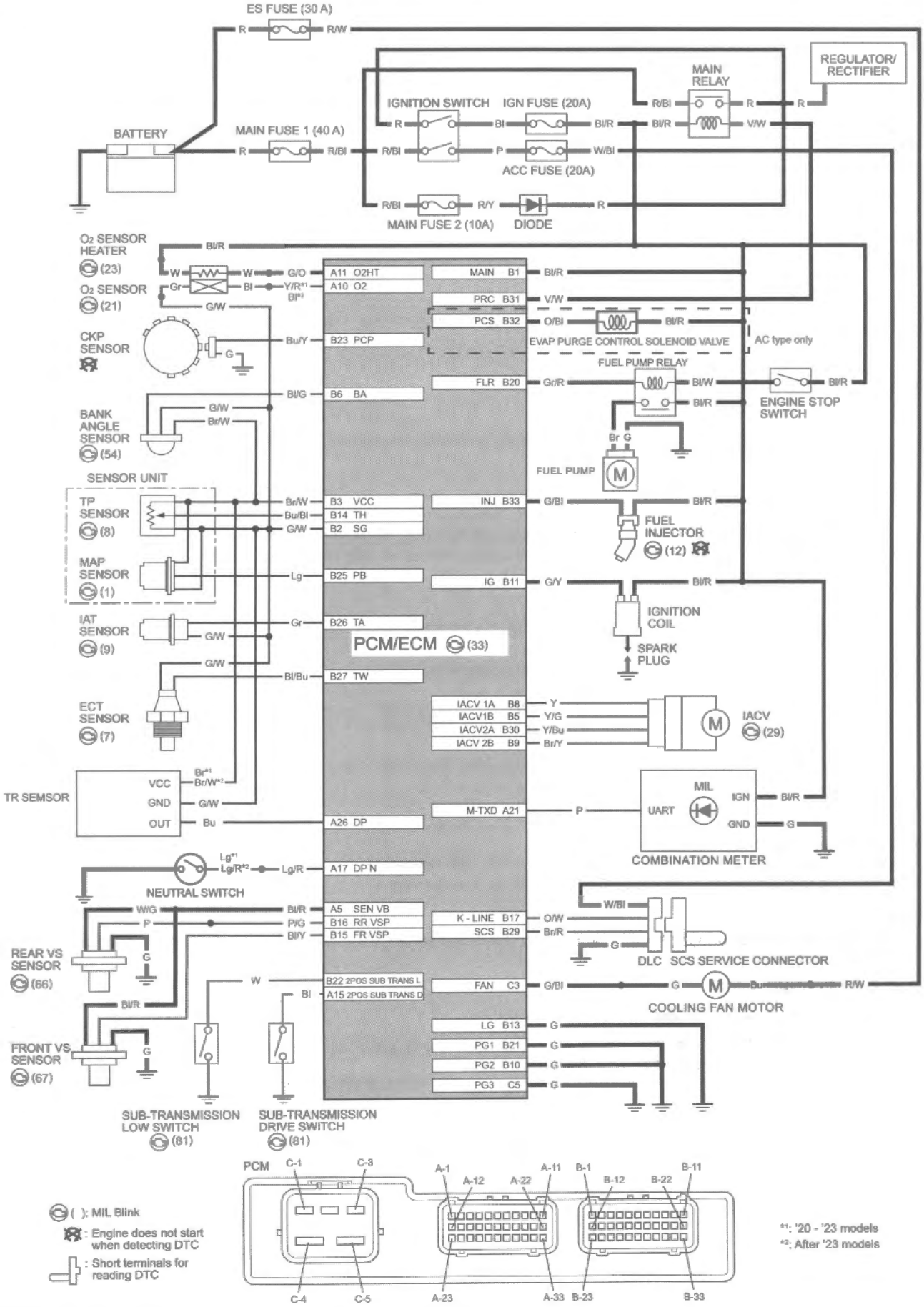
FE2 (After '19):


ES FUSE (30 A)
BATTERY
MAIN 1 FUSE (40A)
IGNITION SWITCH
IGN FUSE (20A)
MAIN RELAY
REGULATOR/ RECTIFIER
ACC FUSE (20A)
MAIN FUSE 2 (10A)
DIODE
ENGINE STOP SWITCH
PCM/ECM (33)
SENSOR UNIT
CKP SENSOR
TP SENSOR (8)
MAP SENSOR (1)
BANK ANGLE SENSOR (54)
IAT SENSOR (9)
ECT SENSOR (7)
O2 SENSOR (21,23)
TR SENSOR
NEUTRAL SWITCH
EVAP PURGE CONTROL SOLENOID VALVE
AC type only
FUEL PUMP RELAY
FUEL PUMP
FUEL INJECTOR (12)
IGNITION COIL
SPARK PLUG
IACV (29)
COMBINATION METER
VS SENSOR (66)
DLC
SCS SERVICE CONNECTOR
COOLING FAN MOTOR
( ): MIL Blink
: Engine does not start when detecting DTC
: Short terminals for reading DTC
5P (Black) CONNECTOR
33P (Black) CONNECTOR
33P (Gray) CONNECTOR

FA models ('15 – '19):



FA models (After '19):



PGM-FI TROUBLESHOOTING INFORMATION

GENERAL TROUBLESHOOTING

Intermittent Failure

The term "intermittent failure" means a system may have had a failure, but it checks OK now. If the MIL does not come on, check for poor contact or loose pins at all connectors related to the circuit with the trouble. If the MIL was on, but then went out, the original problem may be intermittent.

Opens and Shorts

"Opens" and "Shorts" are common electrical terms. An open is a break in a wire or at a connection. A short is an accidental connection of a wire to ground or to another wire. In simple electronics, this usually means something will not work at all. With PCM/ECMs this can mean something will work, but not the way it's supposed to.

If the MIL has come on

Refer to DTC READOUT (page 4-13).

If the MIL did not stay on

If the MIL did not stay on, but there is a driveability problem, do the SYMPTOM TROUBLESHOOTING (page 4-15).

SYSTEM DESCRIPTION

SELF-DIAGNOSIS SYSTEM

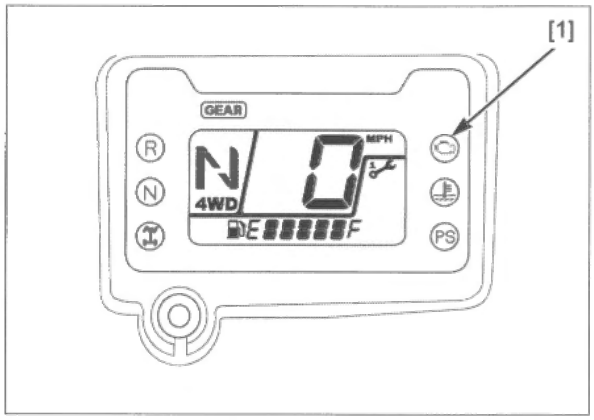
The PGM-FI system is equipped with the self-diagnostic system. When any abnormality occurs in the system, the PCM/ECM turns on the MIL and stores a DTC in its erasable memory.

FAIL-SAFE FUNCTION

The PGM-FI system is provided with a fail-safe function to secure a minimum running capability even when there is trouble in the system. When any abnormality is detected by the self-diagnosis function, running capability is maintained by pre-programed value in the simulated program map. When any abnormality is detected in the fuel injector and/or CKP sensor, the fail-safe function stops the engine to protect it from damage.

MIL Blink Pattern

- If the MCS is not available, DTC can be read from the PCM/ECM memory by the MIL [1] blink pattern.
- The number of MIL blinks is the equivalent to the main code of the DTC (the sub code cannot be displayed by the MIL).
- The MIL will blink the current DTC, in case the PCM/ECM detects the problem at present, when the ignition switch ON or idling. The MIL will stay ON when driving.
- The MIL has two types of blinks, a long blink and short blink. The long blinking lasts for 1.2 seconds, the short blinking lasts for 0.4 seconds. One long blink is the equivalent of ten short blinks. For example, when two long blinks are followed by nine short blinks, the DTC is 29 (two long blinks = 20 blinks, plus nine short blinks).
- When the PCM/ECM stores more than one DTC, the MIL will indicate them by blinking in the order from the lowest number to highest number.



MIL Check

When the ignition switch is turned ON, the MIL will stay on for a few seconds, then go off. If the MIL does not come on, inspect the combination meter (page 24-7).

CURRENT DTC/STORED DTC

The DTC is indicated in two ways according to the failure status.

- In case the PCM/ECM detects the problem at present, the MIL will come on and the MIL will start to blink as its DTC. It is possible to readout the MIL blink pattern as the current DTC.
- In case the PCM/ECM does not detect any problem at present but has a problem stored in its memory, the MIL will not light and blink. If it is necessary to retrieve the past problem, readout the stored DTC by following the DTC readout procedure (page 4-13).

MCS INFORMATION

- The MCS can readout the DTC, stored data, current data and other PCM/ECM condition.

How to connect the MCS

Remove the radiator cap lid (page 2-3).

Turn the ignition switch OFF.

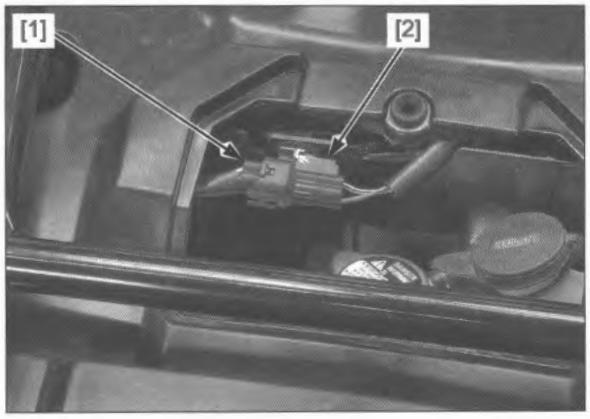
Disconnect the DLC [1] from the accessory socket sub harness 4P (Red) connector [2].

Connect the MCS to the DLC.

Turn the ignition switch ON, check the DTC and stored data.

NOTE:

- Stored data indicates the engine conditions when the first malfunction was detected.



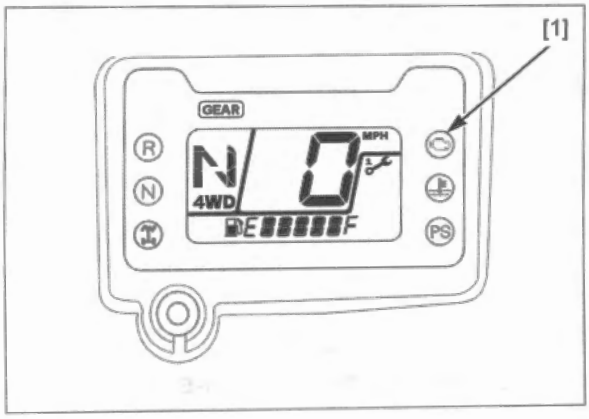
DTC READOUT

- When the ignition switch is turned ON, the MIL [1] will stay on for a few seconds, then go off.
- After performing diagnostic troubleshooting, erase the problem code(s) (page 4-14) and test-ride the vehicle to be sure that the problem(s) have been removed.

If the MIL stays on or blinks, connect the MCS to the DLC (page 4-13).

Read the DTC, stored data and follow the troubleshooting index (page 4-16).

To read the DTC with the MIL blinking, refer to the following procedure.



Reading DTC with the MIL

Start the engine and let it idle. Read the MIL blinking that is indicated as the current DTC and refer to the troubleshooting index (page 4-16).

When retrieving the stored DTC, refer to the following procedure.

Disconnect the DLC (page 4-13).

Short the DLC [1] terminals using the special tool.

TOOL:
[2] SCS service connector 070PZ-ZY30100

Connection: Brown/red – Green

Turn the ignition switch ON, read, note the MIL blinks and refer to the troubleshooting index (page 4-16).

NOTE:

- If the PCM/ECM has any DTC in its memory, the MIL will start blinking.



ERASING DTC

NOTE:

- When erasing the PGM-FI DTC as follows, the differential lock DTC and ESP DTC would also be erased at the same time, check the differential lock and gear position indicators blink and troubleshoot the differential lock and ESP systems before readout/erasing the PGM-FI DTC.

Disconnect the DLC (page 4-13).

Erase the DTC with the MCS while the engine is stopped.

To erase the DTC without MCS, refer to the following procedure.

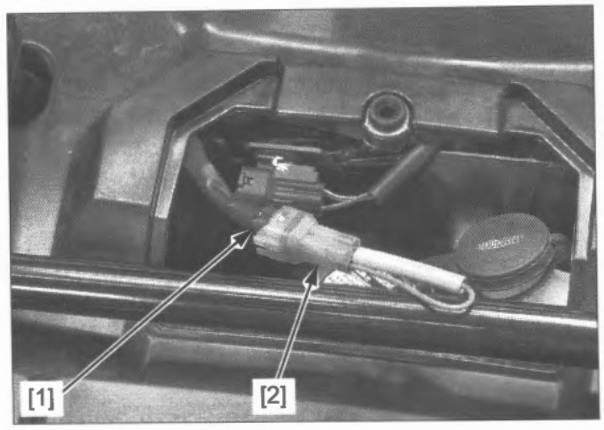
How to erase the DTC without MCS

1. Disconnect the DLC (page 4-13).
2. Short the DLC [1] terminals using the special tool.

   TOOL:
   [2] SCS service connector 070PZ-ZY30100

   Connection: Brown/red – Green

3. Turn the ignition switch ON.
4. Remove the special tool from the DLC.
5. The MIL will light for approximately 5 seconds. While the MIL lights, short the DLC terminals again with the special tool. The self-diagnostic memory is erased if the MIL goes off and starts blinking.



NOTE:

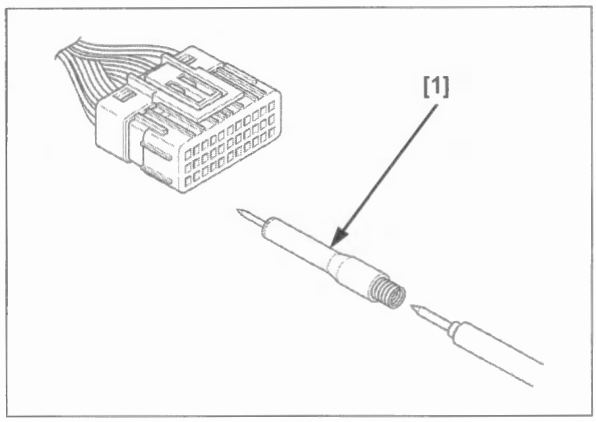
- The DLC must be shorted while the MIL lights. If not, the MIL will not start blinking.
- Note that the self-diagnostic memory cannot be erased if the ignition switch is turned OFF before the MIL starts blinking.

CIRCUIT INSPECTION

INSPECTION AT PCM/ECM CONNECTOR

- Always clean around and keep any foreign material away from the PCM/ECM connector before disconnecting it.
- A faulty PGM-FI system is often related to poorly connected or corroded connections. Check those connections before proceeding.
- Do not pull the wire harness while disconnecting the PCM/ECM connectors.
- In testing at PCM/ECM connector (wire harness side) terminal, always use the test probe. Insert the test probe into the connector terminal, then attach the digital multimeter probe to the test probe.

  TOOL:
  [1] Pin Probe Male (2 pack) 07ZAJ-RDJA110



SYMPTOM TROUBLESHOOTING

When the vehicle has one of these symptoms, check the DTC or MIL blinking, refer to the DTC index (page 4-16) and begin the appropriate troubleshooting procedure. If there are no DTC/MIL blinking stored in the PCM/ECM memory, do the diagnostic procedure for the symptom, in the sequence listed below, until you find the cause.

Symptom	Diagnosis procedure	Also check for
Engine cranks, but won't start (No DTC and MIL blinking)	1. Check the spark plug (page 3-7). 2. Inspect the ignition system (page 5-5). 3. Inspect the fuel supply system. – fuel pressure/flow (page 7-11) – fuel pump (page 7-13) 4. Inspect the cylinder compression (page 10-6) 5. Check the IACV (page 7-23).	• No fuel to fuel injector – Pinched or clogged fuel pump breather hose – Pinched or clogged fuel hose – Clogged fuel pump filter – Faulty fuel pump circuits • Intake air leak • Contaminated/deteriorated fuel • Faulty fuel injector
Engine cranks, but won't start (Gear position indicator continuously blinking "–")	1. PCM/ECM power/ground circuits malfunction (page 4-45).	• Open circuit in the power input and/or ground wire of the PCM/ECM
Engine cranks, but won't start (No fuel pump operation sound when turning the ignition switch ON and engine stop switch "○")	1. PCM/ECM engine stop switch circuit malfunction (page 4-46). 2. Inspect the fuel supply system (page 7-13).	• Open circuit in the engine stop switch wire of the PCM/ECM • Faulty fuel pump relay or related circuit • Faulty fuel pump or related circuits
Engine stalls, hard to start, rough idling	1. Check the spark plug (page 3-7). 2. Check the air cleaner (page 3-5). 3. Check the idle speed (page 3-15). 4. Check the IACV (page 7-23). 5. Inspect the fuel supply system. – fuel pressure/flow (page 7-11) – fuel pump (page 7-13) 6. Inspect the cylinder compression (page 10-6)	• Restricted fuel hose • Contaminated/deteriorated fuel • Intake air leak • Restricted fuel pump breather hose
Backfiring or misfiring during acceleration	Inspect the ignition system (page 5-5).	
Poor performance (driveability) and poor fuel economy	1. Check the muffler tail (spark arrester) (page 3-30). 2. Check the air cleaner (page 3-5). 3. Inspect the fuel supply system. – fuel pressure/flow (page 7-11) – fuel pump (page 7-13) 4. Inspect the ignition system (page 5-5). 5. Inspect the cylinder compression (page 10-6)	• Clogged muffler tail (spark arrester) • Pinched or clogged fuel pump breather hose • Pinched or clogged fuel hose • Faulty fuel injector
Idle speed is below specifications or fast idle too low (No DTC and MIL blinking)	1. Check the idle speed (page 3-15). 2. Check the spark plug (page 3-7). 3. Check the air cleaner (page 3-5). 4. Check the IACV (page 7-23). 5. Inspect the fuel supply system. – fuel pressure/flow (page 7-11) – fuel pump (page 7-13) 6. Inspect the ignition system (page 5-5).	
Idle speed is above specifications or fast idle too high (No DTC and MIL blinking)	1. Check the idle speed (page 3-15). 2. Check the throttle operation and lever freeplay (page 3-4). 3. Check the IACV (page 7-23). 4. Inspect the ignition system (page 5-5).	• Intake air leak • Engine top end problem
Gear position indicator continuously blinking "–".	Inspect the serial communication line (page 24-9).	
MIL stays on at all times (No DTC set)	Inspect the MIL circuit (page 4-40).	

DTC INDEX

'14 – '19:

- If not using the MCS, perform all inspections according to the relevant main code.

DTC	Function Failure	Symptom/Fail-safe function	Refer to
1-1	MAP sensor circuit low voltage (less than 0.195 V) • MAP sensor or its circuit malfunction	• Engine operates normally • Pre-program value: 64 kPa	4-20
1-2	MAP sensor circuit high voltage (more than 3.804 V) • Loose or poor contact of the MAP sensor connector • MAP sensor or its circuit malfunction	• Engine operates normally • Pre-program value: 64 kPa	4-21
7-1	ECT sensor circuit low voltage (less than 0.015 V) • ECT sensor or its circuit malfunction	• Hard to start at a low temperature • Pre-program value: 78.6°C/ 173.5°F • Cooling fan turns on	4-23
7-2	ECT sensor circuit high voltage (more than 4.981 V) • Loose or poor contact of the ECT sensor connector • ECT sensor or its circuit malfunction	• Hard to start at a low temperature • Pre-program value: 78.6°C/ 173.5°F • Cooling fan turns on	4-24
8-1	TP sensor circuit low voltage (less than 0.107 V) • Loose or poor contact of the TP sensor connector • TP sensor or its circuit malfunction	• Poor engine acceleration • Pre-program value: 0° • ESP does not work	4-25
8-2	TP sensor circuit high voltage (more than 4.981 V) • TP sensor or its circuit malfunction	• Poor engine acceleration • Pre-program value: 0° • ESP does not work	4-27
9-1	IAT sensor circuit low voltage (less than 0.015 V) • IAT sensor or its circuit malfunction	• Engine operates normally • Pre-program value: 34.8°C/ 94.6°F	4-28
9-2	IAT sensor circuit high voltage (more than 4.981 V) • Loose or poor contact of the IAT sensor connector • IAT sensor or its circuit malfunction	• Engine operates normally • Pre-program value: 34.8°C/ 94.6°F	4-29
11-1	VS sensor no signal • Loose or poor contact of the VS sensor connector • VS sensor or its circuit malfunction	• Engine operates normally • ESP does not work	25-13
12-1	Fuel Injector circuit malfunction • Loose or poor contact of the fuel injector connector • Fuel Injector or its circuit malfunction	• Engine does not start • Fuel Injector, fuel pump and ignition shut down	4-30
21-1	O_2 sensor malfunction • Loose or poor contact of the O_2 sensor connector • O_2 sensor or its circuit malfunction	• Engine operates normally	4-32
23-1	O_2 sensor heater circuit malfunction • Loose or poor contact of the O_2 sensor heater connector • O_2 sensor heater or its circuit malfunction	• Engine operates normally	4-33
29-1	IACV circuit malfunction • Loose or poor contact of the IACV connector • IACV or its circuit malfunction	• Engine stalls, hard to start, rough idling	4-35
41-1	Except FA: Gear position switch/FA: Shift drum position switch malfunction • Loose or poor contact of the gear/shift drum position switch connector • Gear/shift position switch/ or its circuit malfunction	• Engine operates normally • ESP does not work • Gear position indicator blinks "–"	Except FA: 25-22 FA: 13-31
54-1	Bank angle sensor circuit low voltage • Bank angle sensor or its circuit malfunction	• Engine operates normally • Bank angle sensor stops the control	4-37
54-2	Bank angle sensor circuit high voltage • Loose or poor contact of the bank angle sensor connector • Bank angle sensor or its circuit malfunction	• Engine operates normally • Bank angle sensor stops the control	4-38

DTC	Function Failure	Symptom/Fail-safe function	Refer to
66-1 (FA models only)	Rear VS sensor no signal • Loose or poor contact of the rear VS sensor connector • Rear VS sensor or its circuit malfunction	• Engine operates normally • Gearshift function does not work (2nd, 4th or reverse gear only)	13-39
67-1 (FA models only)	Front VS sensor no signal • Loose or poor contact of the front VS sensor connector • Front VS sensor or its circuit malfunction	• Engine operates normally • Gearshift function does not work (2nd, 4th or reverse gear only)	13-42
81-1 (FA models only)	Sub-transmission switches malfunction (Low and drive switches remain on simultaneously for more than 1.5 seconds) • Sub-transmission switch or its circuit malfunction	• Gearshift function does not work (2nd, 4th or reverse gear only)	14-15

After '19:

- If not using the MCS, perform all inspections according to the relevant main code.

DTC	Function Failure	Symptom/Fail-safe function	Refer to
1-1	MAP sensor circuit low voltage (less than 0.195 V) • MAP sensor or its circuit malfunction	• Engine operates normally • Pre-program value: 64 kPa	4-20
1-2	MAP sensor circuit high voltage (more than 3.804 V) • Loose or poor contact of the MAP sensor connector • MAP sensor or its circuit malfunction	• Engine operates normally • Pre-program value: 64 kPa	4-21
7-1	ECT sensor circuit low voltage (less than 0.078 V) • ECT sensor or its circuit malfunction	• Hard to start at a low temperature • Pre-program value: 69.9°C/ 157.8°F • Cooling fan turns on	4-23
7-2	ECT sensor circuit high voltage (more than 4.922 V) • Loose or poor contact of the ECT sensor connector • ECT sensor or its circuit malfunction	• Hard to start at a low temperature • Pre-program value: 69.9°C/ 157.8°F • Cooling fan turns on	4-24
8-1	TP sensor circuit low voltage (less than 0.225 V) • Loose or poor contact of the TP sensor connector • TP sensor or its circuit malfunction	• Poor engine acceleration • Pre-program value: 0° • ESP does not work (FE model only)	4-25
8-2	TP sensor circuit high voltage (more than 4.922 V) • TP sensor or its circuit malfunction	• Poor engine acceleration • Pre-program value: 0° • ESP does not work (FE model only)	4-27
9-1	IAT sensor circuit low voltage (less than 0.078 V) • IAT sensor or its circuit malfunction	• Engine operates normally • Pre-program value: 32.9°C/ 91.2°F	4-28
9-2	IAT sensor circuit high voltage (more than 4.922 V) • Loose or poor contact of the IAT sensor connector • IAT sensor or its circuit malfunction	• Engine operates normally • Pre-program value: 32.9°C/ 91.2°F	4-29
11-1 (FM models only)	VS sensor no signal • Loose or poor contact of the VS sensor connector • VS sensor or its circuit malfunction	• Engine operates normally • Gear position indicator blinks "–"	25-13
12-1	Fuel Injector circuit malfunction • Loose or poor contact of the fuel injector connector • Fuel Injector or its circuit malfunction	• Engine does not start • Fuel Injector, fuel pump and ignition shut down	4-30
21-1	O_2 sensor malfunction • Loose or poor contact of the O_2 sensor connector • O_2 sensor or its circuit malfunction	• Engine operates normally	4-32
23-1	O_2 sensor heater circuit malfunction • Loose or poor contact of the O_2 sensor heater connector • O_2 sensor heater or its circuit malfunction	• Engine operates normally	4-33
29-1	IACV circuit malfunction • Loose or poor contact of the IACV connector • IACV or its circuit malfunction	• Engine stalls, hard to start, rough idling	4-35
33-2 *	PCM/ECM EEPROM malfunction	• Rough idling • Does not hold the self-diagnosis data	4-37
41-1 (FM models only)	Gear position switch malfunction • Loose or poor contact of the gear/shift drum position switch connector • Gear position switch or its circuit malfunction	• Engine operates normally	25-22
54-1	Bank angle sensor circuit low voltage (less than 0.352 V) • Bank angle sensor or its circuit malfunction	• Engine operates normally • Bank angle sensor stops the control	4-37
54-2	Bank angle sensor circuit high voltage (more than 4.531 V) • Loose or poor contact of the bank angle sensor connector • Bank angle sensor or its circuit malfunction	• Engine operates normally • Bank angle sensor stops the control	4-38
66-1 (66) (FE models only)	VS sensor no signal • Loose or poor contact of the VS sensor connector • VS sensor or its circuit malfunction	• Engine operates normally • Gear position indicator blinks "–" • EPS does not work	25-13

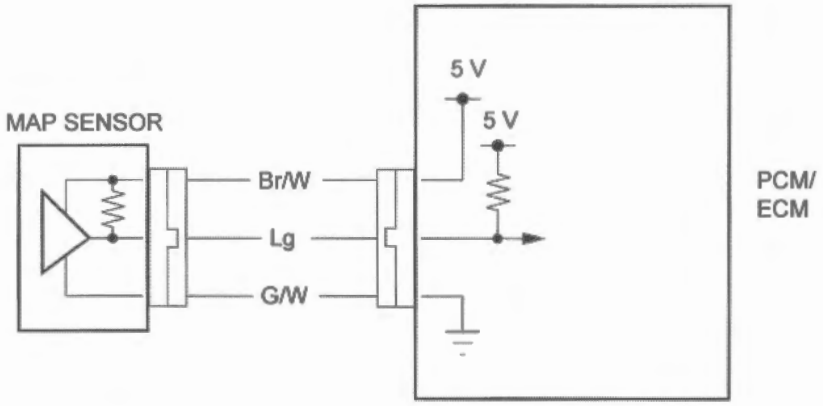
DTC	Function Failure	Symptom/Fail-safe function	Refer to
66-1 (66) (FA models only)	Rear VS sensor no signal • Loose or poor contact of the rear VS sensor connector • Rear VS sensor or its circuit malfunction	• Engine operates normally • Gear position indicator blinks "–" • Gearshift function does not work	13-39
67-1 (67) (FA models only)	Front VS sensor no signal • Loose or poor contact of the front VS sensor connector • Front VS sensor or its circuit malfunction	• Gear position indicator blinks "–" • Engine operates normally • Gearshift function does not work	13-42
81-1 (FA models only)	Sub-transmission position switches malfunction • Sub-transmission position switch or its circuit malfunction	• Gearshift function does not work	14-15

* The MIL does not blink (DTC can be readout/erased only by MCS).

DTC TROUBLESHOOTING

DTC 1 (MAP SENSOR)

- Before starting the inspection, check for loose or poor contact on the sensor unit 5P (Black) connector and PCM/ECM 33P connectors, and recheck the DTC.



Probable cause

- Open circuit in Brown/white wire between the MAP sensor and PCM/ECM
- Open or short circuit in Light green wire between the MAP sensor and PCM/ECM
- Open circuit in Green/white wire between the MAP sensor and PCM/ECM
- Faulty MAP sensor
- Faulty PCM/ECM

DTC 1-1 (MAP SENSOR LOW VOLTAGE)

1. **MAP Sensor System Inspection**

   Check the MAP sensor with the MCS.

   Is about 0 V indicated?

   YES – GO TO STEP 2.

   NO – Intermittent failure.

2. **MAP Sensor Input Voltage Inspection**

   Disconnect the sensor unit 5P (Black) connector (page 4-40).
   Turn the ignition switch ON.

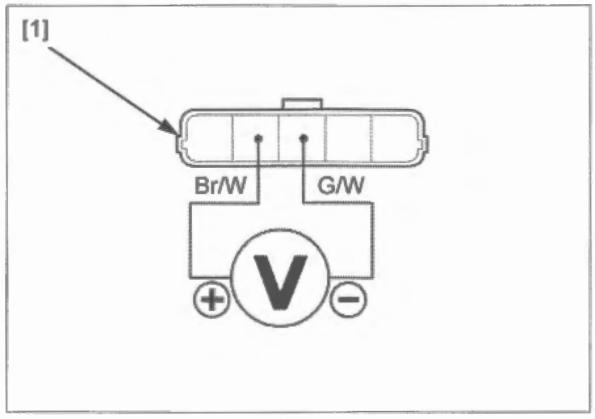
   Measure the voltage between the wire harness side sensor unit 5P (Black) connector [1] terminals.

   Connection: Brown/white (+) – Green/white (–)

   Is the voltage within 4.75 – 5.25 V?

   YES – GO TO STEP 4.

   NO – GO TO STEP 3.



3. MAP Sensor Input Line Open Circuit Inspection

Turn the ignition switch OFF.
Disconnect the PCM/ECM 33P (Gray) connector (page 4-45).
Check for continuity between the wire harness side 33P (Gray) connector [1] and 5P (Black) connector [2] terminals.

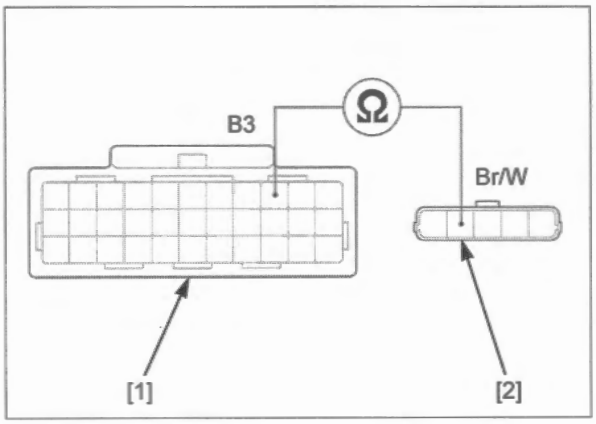
TOOL:
Pin Probe Male (2 pack) 07ZAJ-RDJA110

Connection: B3 – Brown/white

Is there continuity?

YES – Replace the PCM/ECM with a known good one (page 4-45), and recheck.

NO – Open circuit in the Brown/white wire



4. MAP Sensor Output Line Short Circuit Inspection

Turn the ignition switch OFF.

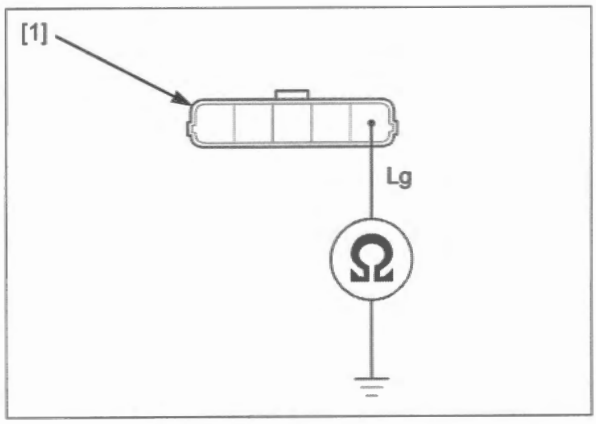
Check for continuity between the wire harness side sensor unit 5P (Black) connector [1] terminal and ground.

Connection: Light green – Ground

Is there continuity?

YES – Short circuit in Light green wire.

NO – GO TO STEP 5.



5. MAP Sensor Inspection

Replace the sensor unit with a known good one (page 4-40).
Erase the DTCs (page 4-14).

Check the MAP sensor with the MCS.

Is DTC 1-1 indicated?

YES – Replace the PCM/ECM with a known good one (page 4-45), and recheck.

NO – Faulty original sensor unit (MAP sensor).

DTC 1-2 (MAP SENSOR HIGH VOLTAGE)

1. MAP Sensor System Inspection

Check the MAP sensor with the MCS.

Is about 5 V indicated?

YES – GO TO STEP 2.

NO –
- Intermittent failure.
- Loose or poor contact of the sensor unit 5P (Black) connector.

2. MAP Sensor Inspection

Disconnect the sensor unit 5P (Black) connector (page 4-40).

Connect the wire harness side sensor unit 5P (Black) connector [1] terminals with a jumper wire [2].

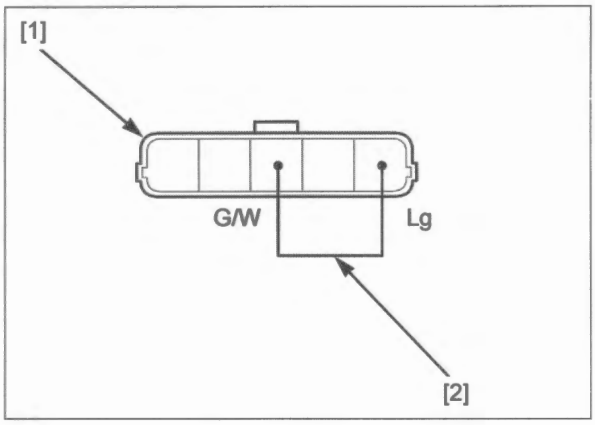
Connection: Light green – Green/white

Check the MAP sensor with the MCS.

Is about 0 V indicated?

YES – Faulty sensor unit (MAP sensor)

NO – GO TO STEP 3.



3. MAP Sensor Input Voltage Inspection

Turn the ignition switch OFF.
Remove the jumper wire.
Turn the ignition switch ON.

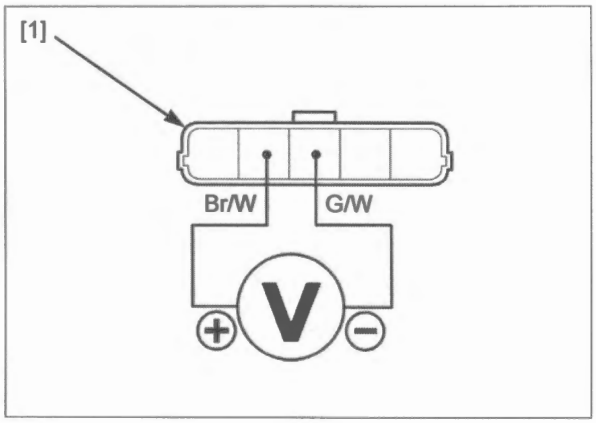
Measure the voltage between the wire harness side sensor unit 5P (Black) connector [1] terminals.

Connection: Brown/white (+) – Green/white (–)

Is the voltage within 4.75 – 5.25 V?

YES – GO TO STEP 4.

NO – Open circuit in the Green/white wire.



4. MAP Sensor Each Line Open Circuit Inspection

Disconnect the PCM/ECM 33P (Gray) connector (page 4-45).

Check for continuity between the wire harness side sensor unit 5P (Black) connector [1] and PCM/ECM 33P (Gray) connector [2] terminals.

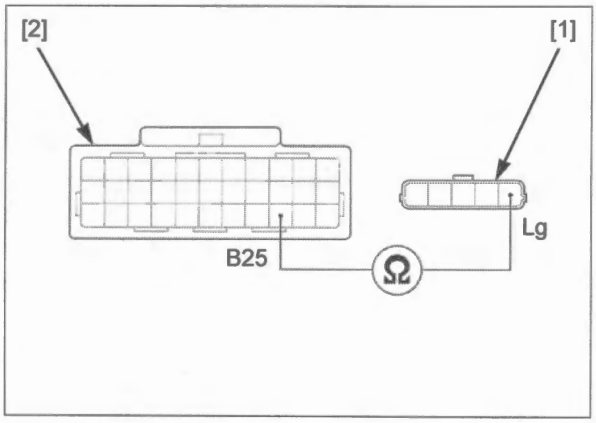
Connection: B25 – Light green

TOOL:
Pin Probe Male (2 pack) **07ZAJ-RDJA110**

Is there continuity?

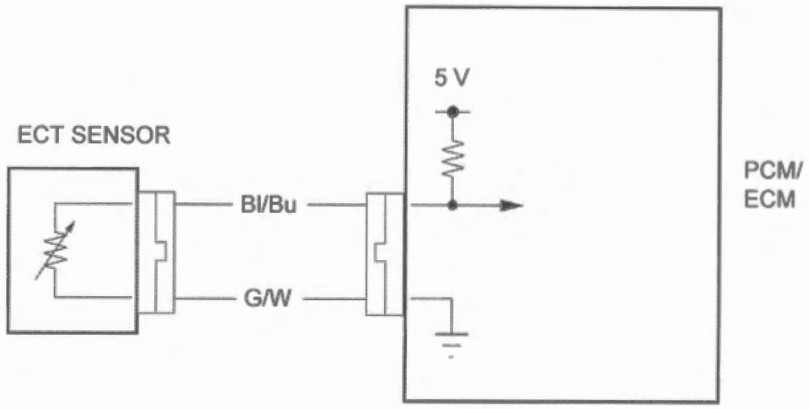
YES – Replace the PCM/ECM with a known good one (page 4-45), and recheck.

NO – Open circuit in the Light green wire.



DTC 7 (ECT SENSOR)

- Before starting the inspection, check for loose or poor contact on the ECT sensor 2P (Black) connector and PCM/ECM 33P connectors, and recheck the DTC.



Probable cause

- Open or short circuit in Black/blue wire between the ECT sensor and PCM/ECM
- Open circuit in Green/white wire between the ECT sensor and PCM/ECM
- Faulty ECT sensor
- Faulty PCM/ECM

DTC 7-1 (ECT SENSOR LOW VOLTAGE)

1. **ECT Sensor System Inspection**

   Check the ECT sensor with the MCS.

   Is about 0 V indicated?

   YES – GO TO STEP 2.

   NO – Intermittent failure.

2. **ECT Sensor Inspection**

   Disconnect the ECT sensor 2P (Black) connector (page 4-43).

   Check the ECT sensor with the MCS.

   Is about 0 V indicated?

   YES – GO TO STEP 4.

   NO – GO TO STEP 3.

3. **ECT Sensor Resistance Inspection**

   Turn the ignition switch OFF.

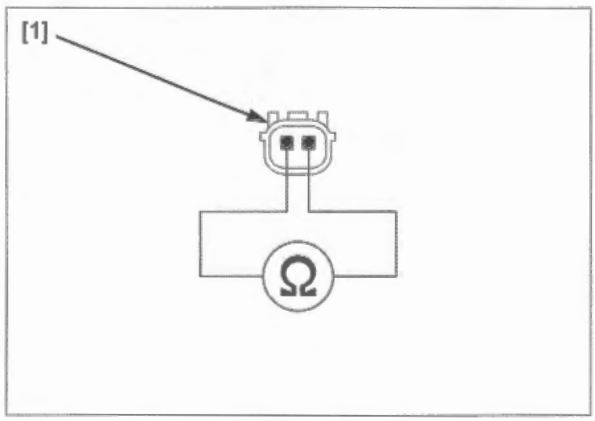
   Measure the resistance between the ECT sensor [1] terminals.

   Standard: 1.0 – 1.3 kΩ (20°C/68°F)

   Is the resistance within standard value?

   YES – Replace the PCM/ECM with a known good one (page 4-45), and recheck.

   NO – Faulty ECT sensor.



4. ECT Sensor Output Line Short Circuit Inspection

Turn the ignition switch OFF.

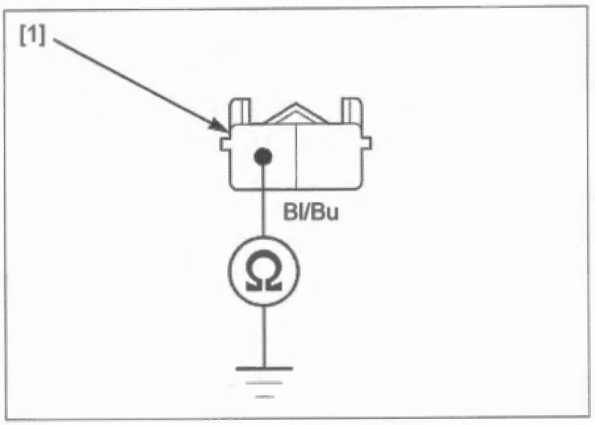
Check for continuity between the wire harness side ECT sensor 2P (Black) connector [1] terminal and ground.

Connection: Black/blue – Ground

Is there continuity?

YES – Short circuit in the Black/blue wire.

NO – Replace the PCM/ECM with a known good one (page 4-45), and recheck.



DTC 7-2 (ECT SENSOR HIGH VOLTAGE)

1. ECT Sensor System Inspection

Check the ECT sensor with the MCS.

Is about 5 V indicated?

YES – GO TO STEP 2.

NO – • Intermittent failure.
• Loose or poor contact of the ECT sensor 2P (Black) connector.

2. ECT Sensor Inspection

Disconnect the ECT sensor 2P (Black) connector (page 4-43).

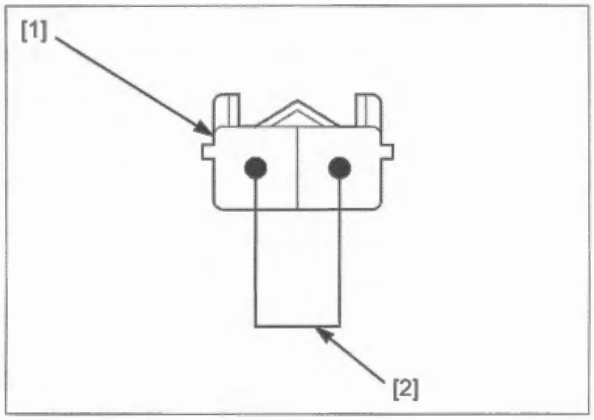
Connect the wire harness side ECT sensor 2P (Black) connector [1] terminals with a jumper wire [2].

Check the ECT sensor with the MCS.

Is about 0 V indicated?

YES – Faulty ECT sensor.

NO – GO TO STEP 3.



3. ECT Sensor Line Open Circuit Inspection

Turn the ignition switch OFF.
Remove the jumper wire.
Disconnect the PCM/ECM 33P (Gray) connector (page 4-45).

Check for continuity between the wire harness side ECT sensor 2P (Black) connector [1] and PCM/ECM 33P (Gray) connector [2] terminals.

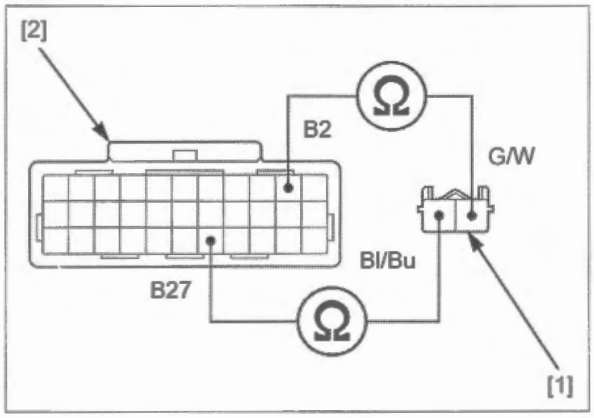
Connection: B2 – Green/white
B27 – Black/blue

TOOL:
Pin Probe Male (2 pack) **07ZAJ-RDJA110**

Is there continuity?

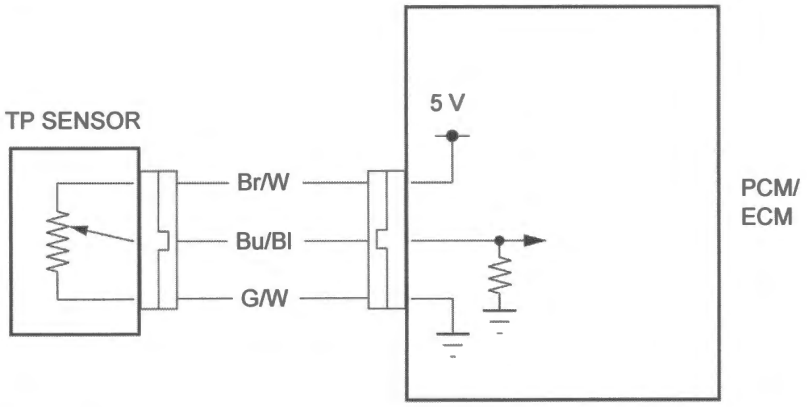
YES – Replace the PCM/ECM with a known good one (page 4-45), and recheck.

NO – • Open circuit in the Green/white wire.
• Open circuit in the Black/blue wire.



DTC 8 (TP SENSOR)

- Before starting the inspection, check for loose or poor contact on the sensor unit 5P (Black) connector and PCM/ECM 33P connectors, and recheck the DTC.



Probable cause

- Open circuit in Brown/white wire between the TP sensor and PCM/ECM
- Open or short circuit in Blue/black wire between the TP sensor and PCM/ECM
- Open circuit in Green/white wire between the TP sensor and PCM/ECM
- Faulty TP sensor
- Faulty PCM/ECM

DTC 8-1 (TP SENSOR LOW VOLTAGE)

1. **TP Sensor System Inspection**

   Check the TP sensor with the MCS with the throttle fully closed.

   Is about 0 V indicated?

   YES – GO TO STEP 3.

   NO – GO TO STEP 2.

2. **TP Sensor Inspection**

   Check that the TP sensor voltage increases continuously when the throttle is moved to fully closed position to fully open position, using the data list menu of the MCS.

   Does the voltage increase continuously?

   YES – • Intermittent failure.
   • Loose or poor contact of the sensor unit 5P (Black) connector.

   NO – Faulty sensor unit (TP sensor).

3. TP Sensor Resistance Inspection

Disconnect the sensor unit 5P (Black) connector (page 4-40).

Measure the resistance between the sensor unit [1] side connector terminals.

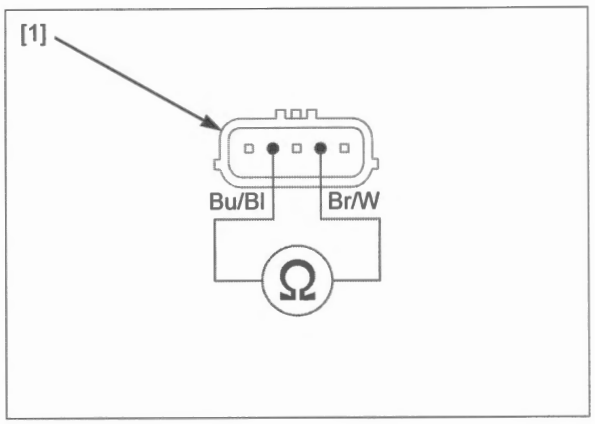
Connection: Blue/black – Brown/white

Standard: 1.0 – 3.0 kΩ (20°C/68°F)

Is the resistance within 1.0 – 3.0 kΩ (20°C/68°F)

YES – GO TO STEP 4.

NO – Faulty TP sensor.



4. TP Sensor Input Voltage Inspection

Turn the ignition switch ON.

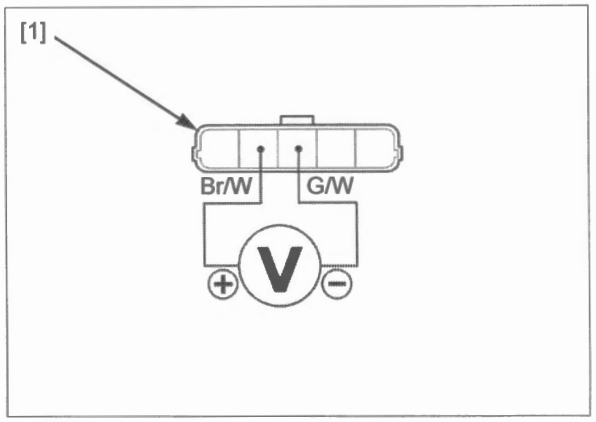
Measure the voltage between the wire harness side sensor unit 5P (Black) connector terminals.

Connection: Brown/white (+) – Green/white (–)

Is the voltage within 4.75 – 5.25 V?

YES – GO TO STEP 6.

NO – GO TO STEP 5.



5. TP Sensor Input Line Open Circuit Inspection

Disconnect the PCM/ECM 33P (Gray) connector (page 4-45).

Check for continuity between the wire harness side sensor unit 5P (Black) connector [1] and PCM/ECM 33P (Gray) connector [2] terminals.

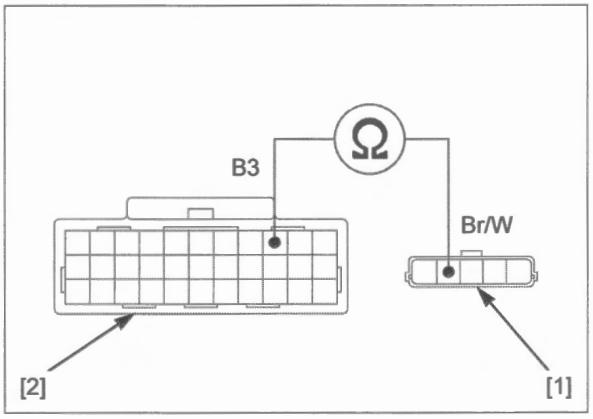
Connection: B3 – Brown/white

TOOL:
Pin Probe Male (2 pack) **07ZAJ-RDJA110**

Is there continuity?

YES – Replace the PCM/ECM with a known good one (page 4-45), and recheck.

NO – Open circuit in the Brown/white wire.



6. TP Sensor Output Line Open Circuit Inspection

Disconnect the PCM/ECM 33P (Gray) connector (page 4-45).

Check for continuity between the wire harness side sensor unit 5P (Black) connector [1] and PCM/ECM 33P (Gray) connector [2] terminals.

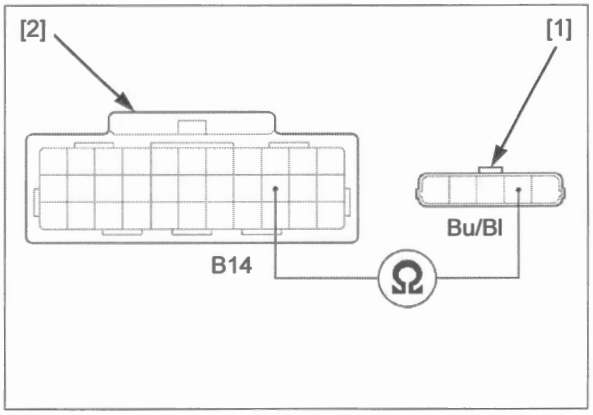
Connection: B14 – Blue/black

TOOL:
Pin Probe Male (2 pack) **07ZAJ-RDJA110**

Is there continuity?

YES – GO TO STEP 7.

NO – Open circuit in the Blue/black wire.



7. **TP Sensor Output Line Short Circuit Inspection**

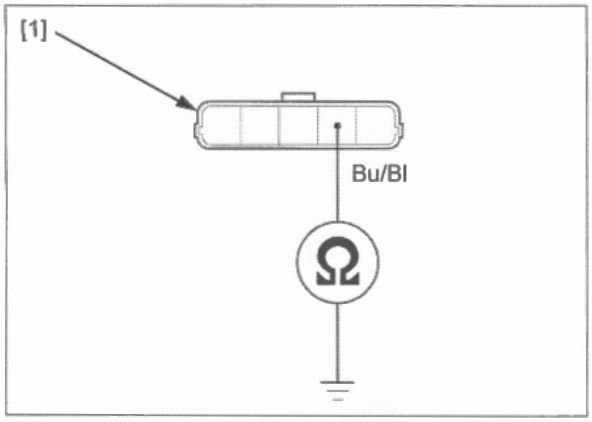
   Check for continuity between the wire harness side sensor unit 5P (Black) connector [1] terminal and ground.

   Connection: Blue/black – Ground

   Is there continuity?

   YES – Short circuit in the Blue/black wire.

   NO – Replace the PCM/ECM with a known good one (page 4-45), and recheck.



DTC 8-2 (TP SENSOR HIGH VOLTAGE)

1. **TP Sensor System Inspection**

   Check the TP sensor with the MCS with the throttle fully closed.

   Is about 5 V indicated?

   YES – GO TO STEP 3.

   NO – GO TO STEP 2.

2. **TP Sensor Inspection**

   Check that the TP sensor voltage increases continuously when the throttle is moved to fully closed position to fully open position, using the data list menu of the MCS.

   Does the voltage increase continuously?

   YES – Intermittent failure.

   NO – Faulty sensor unit (TP sensor).

3. **TP Sensor Resistance Inspection at PCM/ECM Connector**

   Disconnect the sensor unit 5P (Black) connector (page 4-40).

   Measure the resistance between the sensor unit [1] side connector terminals.

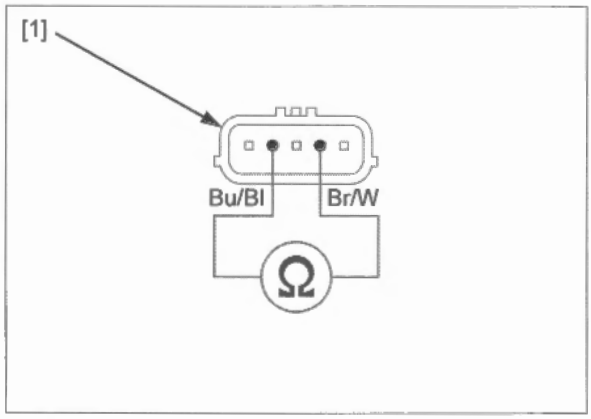
   Connection: Blue/black – Brown/white

   Standard: 1.0 – 3.0 kΩ (20°C/68°F)

   Is the resistance within 1.0 – 3.0 kΩ (20°C/68°F)?

   YES – GO TO STEP 4.

   NO – Faulty sensor unit (TP sensor).



4. TP Sensor Ground Line Open Circuit Inspection

Turn the ignition switch OFF.

Check for continuity between the wire harness side sensor unit 5P (Black) connector [1] and PCM/ECM 33P (Gray) connector [2] terminals.

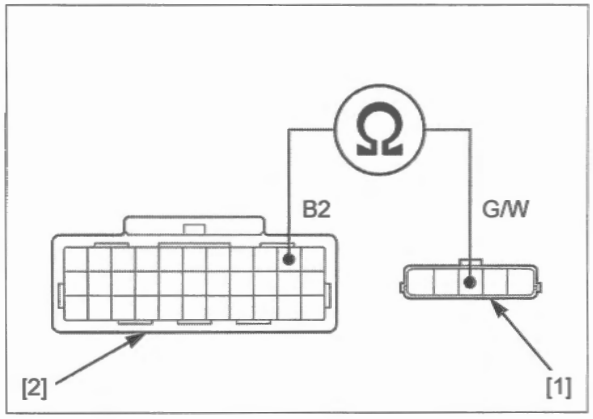
Connection: B2 – Green/white

TOOL:
Pin Probe Male (2 pack) **07ZAJ-RDJA110**

Is there continuity?

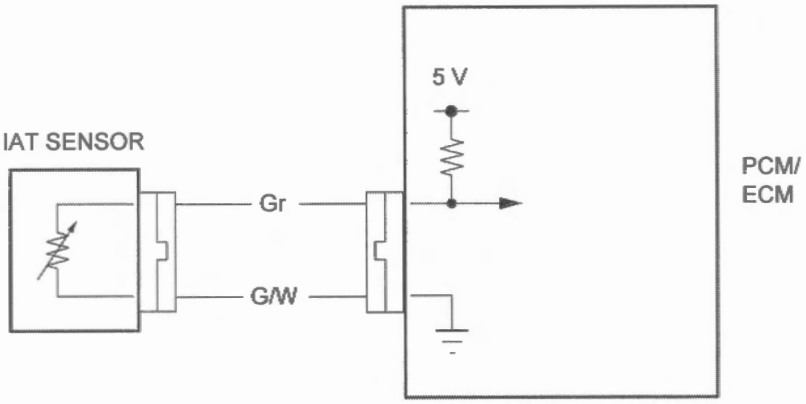
YES – Replace the PCM/ECM with a known good one (page 4-45), and recheck.

NO – Open circuit in Green/white wire.



DTC 9 (IAT SENSOR)

- Before starting the inspection, check for loose or poor contact on the IAT sensor 2P (Black) connector and PCM/ECM 33P connectors, and recheck the DTC.



Probable cause
- Open or short circuit in Gray wire between the IAT sensor and PCM/ECM
- Open circuit in Green/white wire between the IAT sensor and PCM/ECM
- Faulty IAT sensor
- Faulty PCM/ECM

DTC 9-1 (IAT SENSOR LOW VOLTAGE)

1. IAT Sensor System Inspection

Check the IAT sensor with the MCS.

Is about 0 V indicated?

YES – GO TO STEP 2.

NO – Intermittent failure.

2. IAT Sensor Inspection

Disconnect the IAT sensor 2P (Black) connector (page 4-44).

Check the IAT sensor with the MCS.

Is about 0 V indicated?

YES – GO TO STEP 4.

NO – GO TO STEP 3.

3. IAT Sensor Resistance Inspection

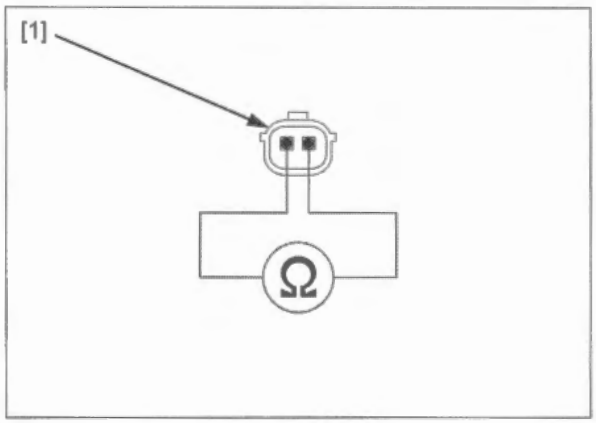
Measure the resistance between the IAT sensor [1] terminals.

Standard: 2.2 – 2.7 kΩ (20°C/68°F)

Is the resistance within 2.2 – 2.7 kΩ (20°C/68°F)?

YES – Replace the PCM/ECM with a known good one (page 4-45), and recheck.

NO – Faulty IAT sensor.



4. IAT Sensor Output Line Short Circuit Inspection

Turn the ignition switch OFF.

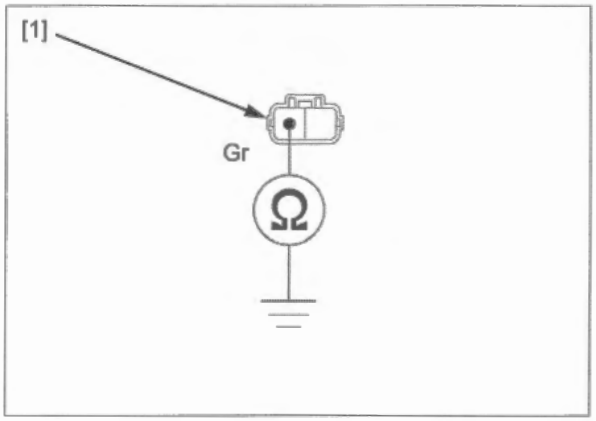
Check for continuity between the wire harness side IAT sensor 2P (Black) connector [1] terminal and ground.

Connection: Gray – Ground

Is there continuity?

YES – Short circuit in the Gray wire.

NO – Replace the PCM/ECM with a known good one (page 4-45), and recheck.



DTC 9-2 (IAT SENSOR HIGH VOLTAGE)

1. IAT Sensor System Inspection

Check the IAT sensor with the MCS.

Is about 5 V indicated?

YES – GO TO STEP 2.

NO – • Intermittent failure.
• Loose or poor contact of the IAT sensor 2P (Black) connector.

2. IAT Sensor Inspection

Disconnect the IAT sensor 2P (Black) connector (page 4-44).

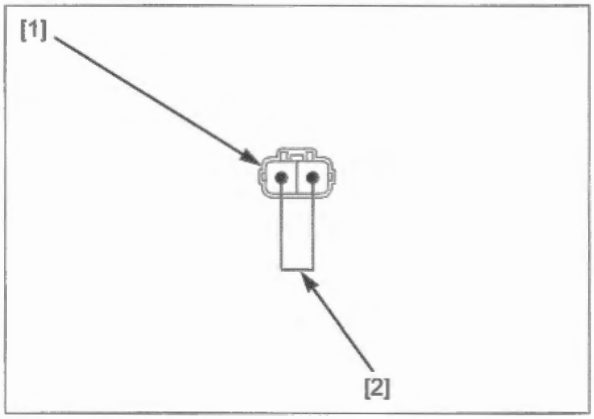
Connect the wire harness side IAT sensor 2P (Black) connector [1] terminals with a jumper wire [2].

Check the IAT sensor with the MCS.

Is about 0 V indicated?

YES – Faulty IAT sensor

NO – GO TO STEP 3.

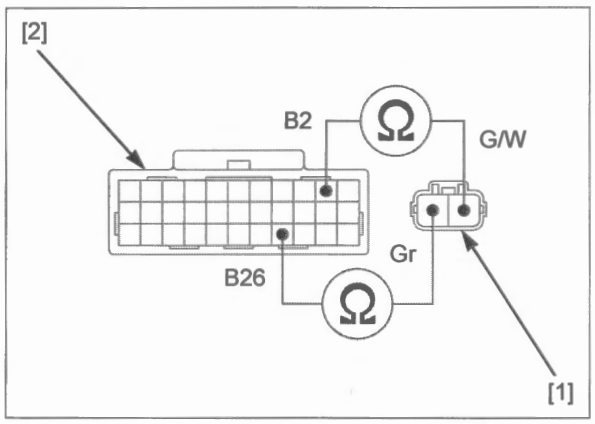


3. IAT Sensor Open Circuit Inspection

Turn the ignition switch OFF.
Remove the jumper wire.
Disconnect the PCM/ECM 33P (Gray) connector (page 4-45).

Check for continuity between the wire harness side IAT sensor 2P (Black) connector [1] and PCM/ECM 33P (Gray) connector [2] terminals.

Connection: B2 – Green/white
B26 – Gray



TOOL:
Pin Probe Male (2 pack) 07ZAJ-RDJA110

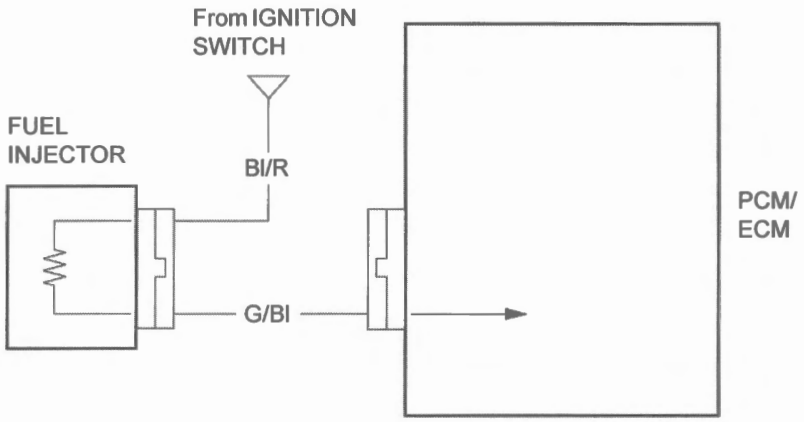
Is there continuity?

YES – Replace the PCM/ECM with a known good one (page 4-45), and recheck.

NO – • Open circuit in the Green/white wire.
• Open circuit in the Gray wire.

DTC 12-1 (FUEL INJECTOR)

- Before starting the inspection, check for loose or poor contact on the fuel injector 2P (Gray) connector and PCM/ECM 33P connectors, and recheck the DTC.



Probable cause
- Open circuit in Black/red wire between the ignition switch and fuel injector
- Open or short circuit in Green/black wire between the fuel injector and PCM/ECM
- Faulty fuel injector
- Faulty PCM/ECM

1. Fuel Injector System Inspection

Erase the DTCs (page 4-14).

Check the fuel injector with the MCS.

Is the DTC 12-1 indicated?

YES – GO TO STEP 2.

NO – • Intermittent failure.
• Loose or poor contact of the connected fuel injector 2P (Gray) connector.

2. Fuel Injector Resistance Inspection

Disconnect the fuel injector 2P (Gray) connector (page 7-24).

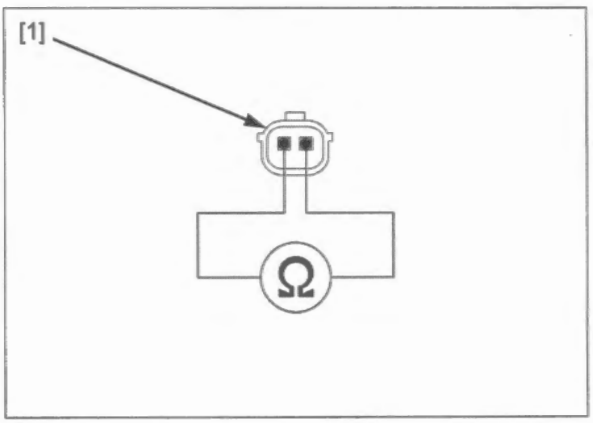
Measure the resistance between the fuel injector side connector [1] terminals.

Standard: 11.1 – 12.3 Ω (20°C/68°F)

Is the resistance within 11.1 – 12.3 Ω (20°C/68°F)?

YES – GO TO STEP 3.

NO – Faulty fuel injector.



3. Fuel Injector Input Voltage Inspection

Turn the ignition switch ON.

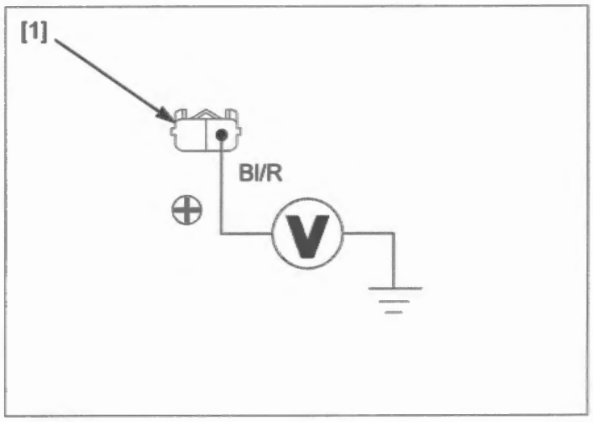
Measure the voltage between the wire harness side fuel injector 2P (Gray) connector [1] terminal and ground.

Connection: Black/red(+) – Ground (–)

Is there battery voltage?

YES – GO TO STEP 4.

NO – Open circuit in the Black/red wire.



4. Fuel Injector Signal Line Short Circuit Inspection

Turn the ignition switch OFF.

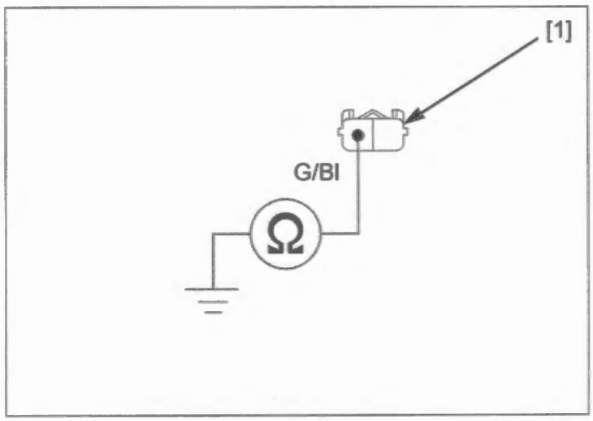
Check for continuity between the wire harness side fuel injector 2P (Gray) connector [1] terminal and ground.

Connection: Green/black – Ground

Is there continuity?

YES – Short circuit in the Green/black wire.

NO – GO TO STEP 5.



5. Fuel Injector Signal Line Open Circuit Inspection

Disconnect the PCM/ECM 33P (Gray) connector (page 4-45).

Check for continuity between the wire harness side fuel injector 2P (Gray) connector [1] and PCM/ECM 33P (Gray) connector [2] terminals.

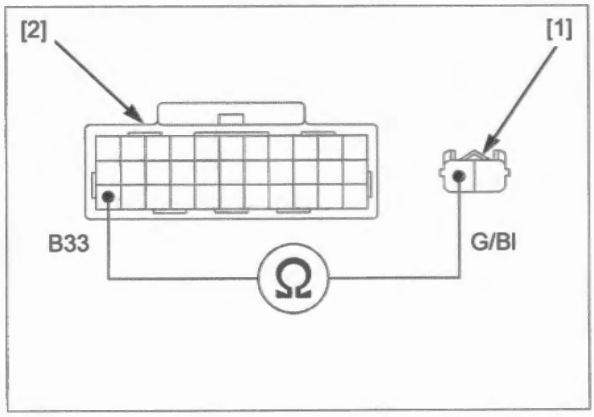
Connection: B33 – Green/black

TOOL:
Pin Probe Male (2 pack) **07ZAJ-RDJA110**

Is there continuity?

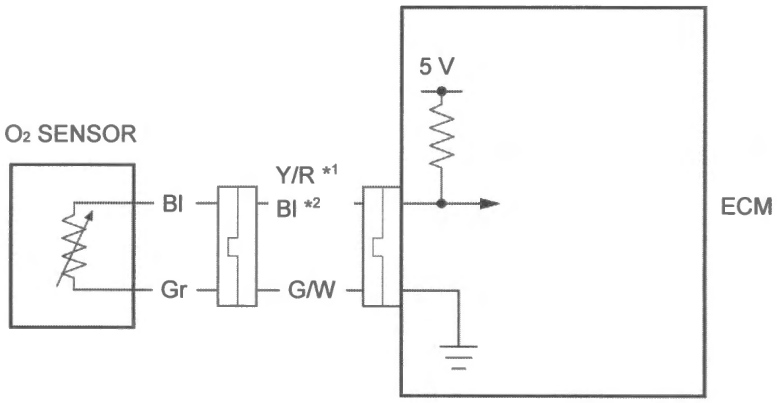
YES – Replace the PCM/ECM with a known good one (page 4-45), and recheck.

NO – Open circuit in the Green/black wire.



DTC 21 (O_2 SENSOR)

- Before starting the inspection, check for loose or poor contact on the O_2 sensor 4P (Black) connector and PCM/ECM 33P connectors, then recheck the DTC.



*1: '19 - '23
*2: After '23

Probable cause
- Open circuit in Gray or Green/white wire between the O_2 sensor and PCM/ECM
- Open or short circuit in Black or Yellow/red wire between the O_2 sensor and PCM/ECM
- Faulty O_2 sensor
- Faulty PCM/ECM

DTC 21-1 (O_2 SENSOR)

1. O_2 Sensor System Inspection

Warm the engine until the coolant temperature is 80°C (176°F).

Check the O_2 sensor with the MCS.

Standard: 0.1 V – 1.2 V

Is the voltage as specified?

YES – • Check the fuel pressure (page 7-11).
• If the system is correct, GO TO STEP 4.

NO – GO TO STEP 2.

2. O_2 Sensor System Short Circuit Inspection

Disconnect the O_2 sensor 4P (Black) connector (page 2-16).

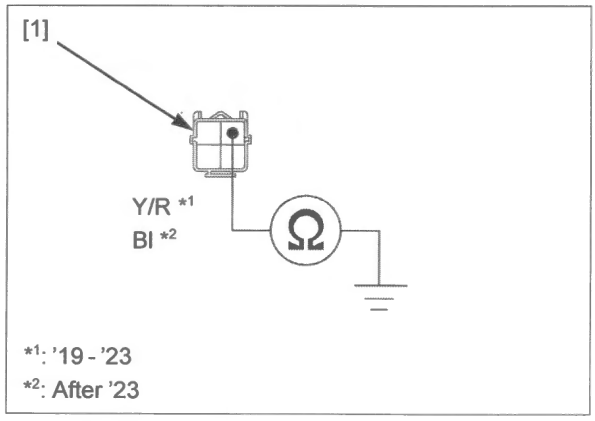
Check for continuity between the wire harness side O_2 sensor 4P (Black) connector [1] terminal and ground.

Connection: '19 - '23: Yellow/red – Ground
After '23: Black – Ground

Is there continuity?

YES – '19 - '23: Short circuit in Yellow/red wire
After '23: Short circuit in Black wire

NO – GO TO STEP 3.



3. O_2 Sensor Open Circuit Inspection

Disconnect the PCM/ECM 33P connectors (page 4-45).

Check for continuity between the wire harness side PCM/ECM 33P (Black) [1] and (Gray) [2] connectors and O_2 sensor 4P (Black) connector [3] terminals.

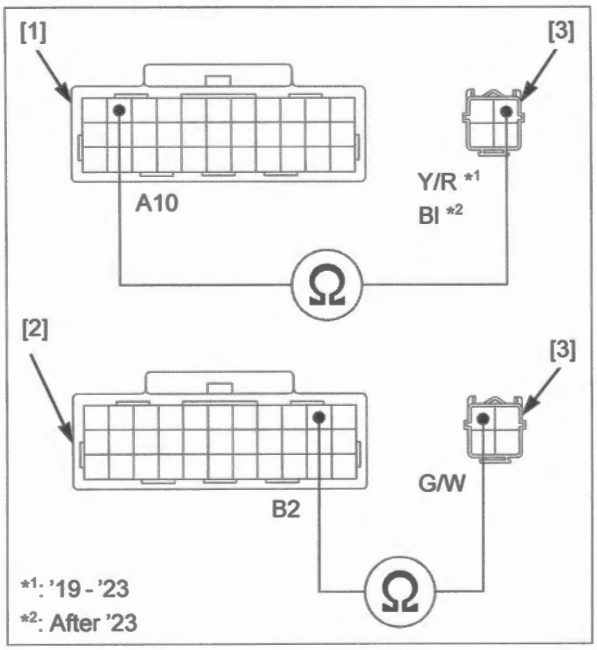
Connection: '19 - '23: A10 – Yellow/red
After '23: A10 – Black
B2 – Green/white

TOOL:
Pin Probe Male (2 pack) 07ZAJ-RDJA110

Is there continuity?

YES – GO TO STEP 4.

NO – • '19 - '23: Open circuit in Yellow/red wire
After '23: Open circuit in Black wire
• Open circuit in Green/white wire



4. O_2 Sensor Inspection

Replace the O_2 sensor with a known good one (page 4-47).

Erase the DTCs (page 4-14).
Turn the ignition switch ON.
Warm the engine until the coolant temperature is 80°C (176°F).

Check the O_2 sensor with the MCS.

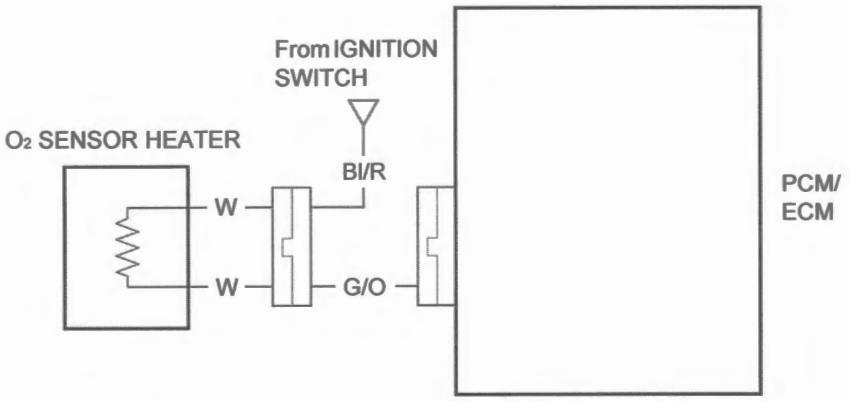
Is DTC 21 – 1 indicated?

YES – Replace the PCM/ECM with a known good one, and recheck

NO – Faulty original O_2 sensor

DTC 23 (O_2 SENSOR HEATER)

- Before starting the inspection, check for loose or poor contact on the O_2 sensor 4P (Black) connector and PCM/ECM 33P connectors, then recheck the DTC.



Probable cause
- Open or short circuit in Green/orange or White wire between the O_2 sensor heater and PCM/ECM
- Open circuit in Black/red or White wire between the O_2 sensor heater and PCM/ECM
- Faulty O_2 sensor heater
- Faulty PCM/ECM

DTC 23-1 (O_2 SENSOR HEATER)

1. **O_2 Sensor System Inspection**

   Erase the DTCs (page 4-14).

   Start the engine and check the O_2 sensor heater with the MCS.

   Is DTC 23-1 indicated?

   YES – GO TO STEP 2.

   NO – Intermittent failure

2. **O_2 Sensor Heater Resistance Inspection**

   Disconnect the O_2 sensor 4P (Black) connector (page 2-16).

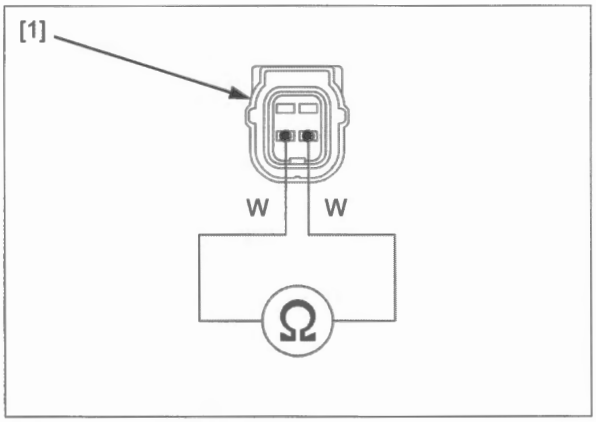
   Measure the resistance between the O_2 sensor [1] terminals.

   Connection: White – White

   Is the resistance within 6.7 – 9.5 Ω (20°C/68°F ± 15°)?

   YES – GO TO STEP 3.

   NO – Faulty O_2 sensor



3. **O_2 Sensor Heater Input Voltage Inspection**

   Turn the ignition switch ON.

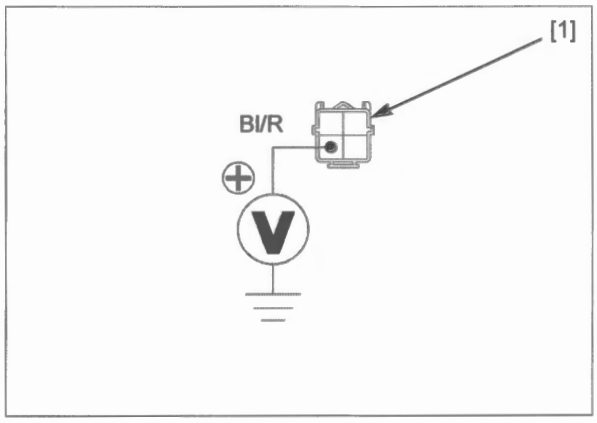
   Measure the voltage between the wire harness side O_2 sensor 4P (Black) connector [1] terminal and ground.

   Connection: Black/red (+) – Ground (–)

   Dose the battery voltage exist?

   YES – GO TO STEP 4.

   NO – Open circuit in Black/red wire



4. **O_2 Sensor Heater Short Circuit Inspection**

   Turn the ignition switch OFF.

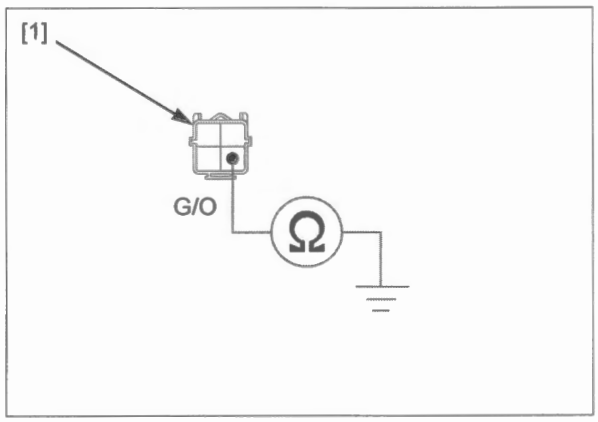
   Check for continuity between the wire harness side O_2 sensor 4P (Black) connector [1] terminal and ground.

   Connection: Green/orange – Ground

   Is there continuity?

   YES – Short circuit in Green/orange wire

   NO – GO TO STEP 5.



5. O_2 Sensor Heater Open Circuit Inspection

Disconnect the PCM/ECM 33P (Black) connector (page 4-45).

Check for continuity between the wire harness side PCM/ECM 33P (Black) connector [1] and O_2 sensor 4P (Black) connector [2] terminals.

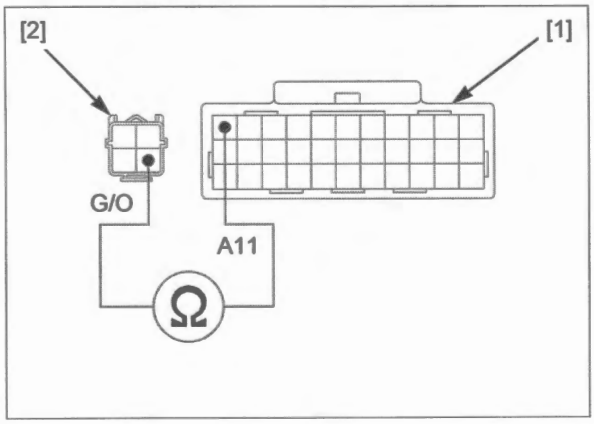
Connection: A11 – Green/orange

TOOL:
Pin Probe Male (2 pack) **07ZAJ-RDJA110**

Is there continuity?

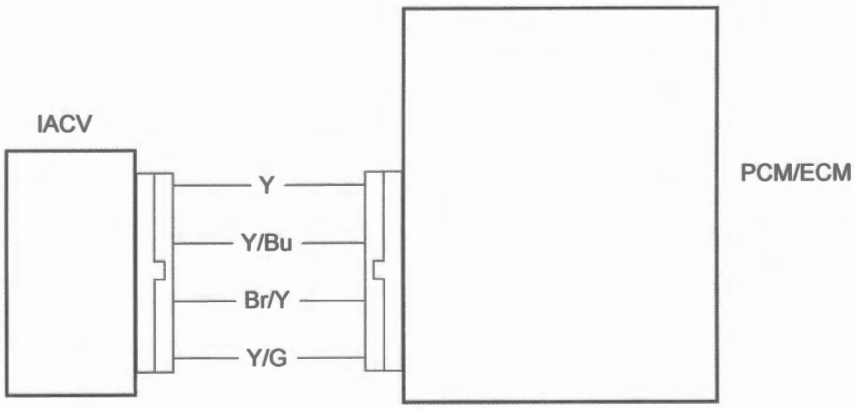
YES – Replace the PCM/ECM with a known good one, and recheck

NO – Open circuit in Green/orange wire



DTC 29 (IACV)

- Before starting the inspection, check for loose or poor contact on the IACV 4P (Black) connector and PCM/ECM 33P connectors, and recheck the DTC.



Probable cause
- Open or short circuit in wires (Yellow, Yellow/blue, Brown/yellow, Yellow/green) between the IACV and PCM/ECM
- Faulty IACV
- Faulty PCM/ECM

DTC 29-1 (IACV)

1. Recheck DTC

Erase the DTCs (page 4-14).

Start the engine and recheck the DTC with the MCS.

Is the DTC 29-1 indicated?

YES – GO TO STEP 2.

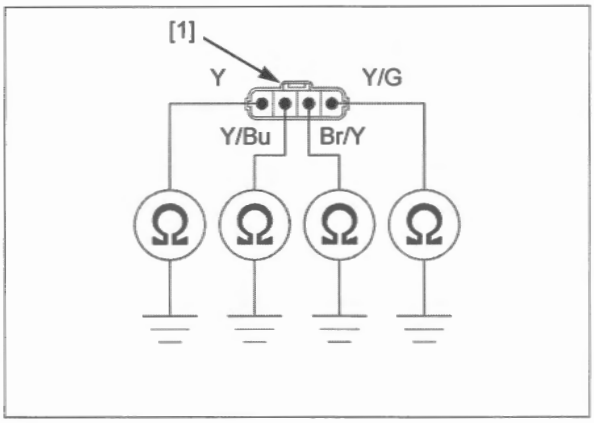
NO – • Intermittent failure.
• Loose or poor contact of the IACV 4P (Black) connector.

2. IACV Short Circuit Inspection

Disconnect the IACV 4P (Black) connector (page 7-23).

Check for continuity between the wire harness side IACV 4P (Black) connector [1] terminals and ground.

Connection: Yellow – Ground
Yellow/blue – Ground
Brown/yellow – Ground
Yellow/green – Ground



Is there continuity?

YES – • Short circuit in the Yellow or Yellow/green wire.
• Short circuit in the Yellow/blue or Brown/yellow wire.

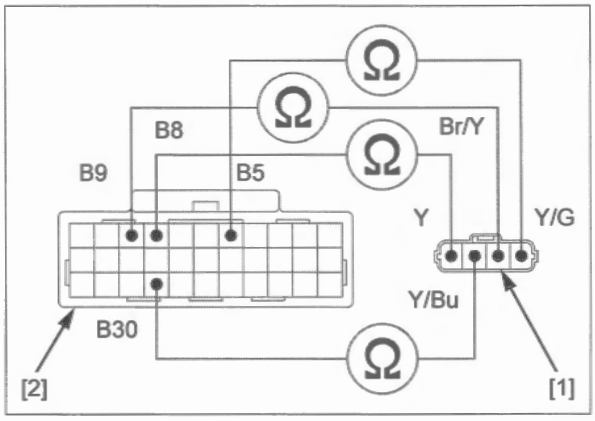
NO – GO TO STEP 3.

3. IACV Circuit Continuity Inspection

Disconnect the PCM/ECM 33P (Gray) connector (page 4-45).

Check for continuity between the wire harness side IACV 4P (Black) connector [1] and PCM/ECM 33P (Gray) connector [2] terminals.

Connection: B5 – Yellow/green
B8 – Yellow
B9 – Brown/yellow
B30 – Yellow/blue



TOOL:
Pin Probe Male (2 pack) 07ZAJ-RDJA110

Are there continuities?

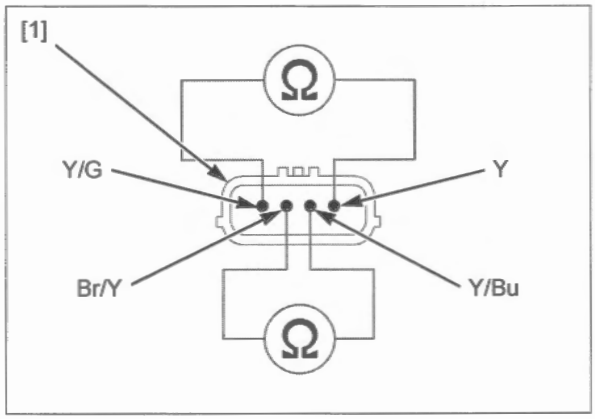
YES – GO TO STEP 4.

NO – • Open circuit in the Yellow or Yellow/green wire.
• Open circuit in the Yellow/blue or Brown/yellow wire.

4. IACV Resistance Inspection

Measure the resistance between the IACV [1] terminals.

Connection: Yellow/green – Yellow
Brown/yellow – Yellow/blue



TOOL:
Pin Probe Male (2 pack) 07ZAJ-RDJA110

Standard: 100 – 120 Ω (25°C/77°F)

Is the resistance within 100 – 120 Ω (20°C/68°F)?

YES – Replace the PCM/ECM with a known good one (page 4-45), and recheck.

NO – Faulty IACV.

DTC 33-2 (EEPROM) (After '19)

1. **Recheck DTC**

   Erase the DTC (page 4-16).
   Recheck the PCM/ECM EEPROM with the MCS.

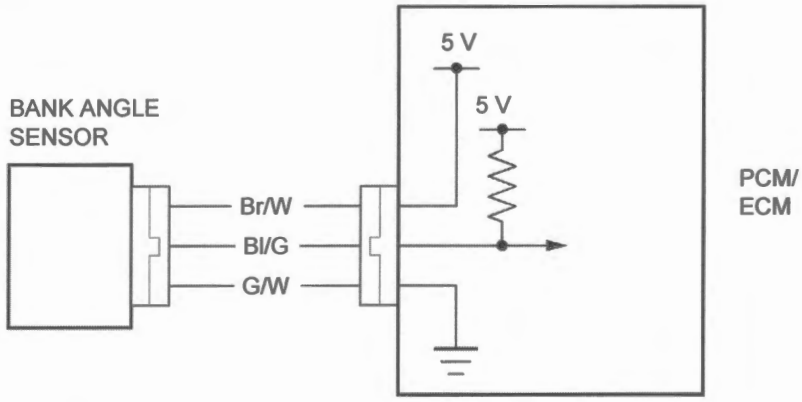
   Is DTC 33-2 indicated?

   YES – Replace the PCM/ECM with a known good one (page 4-45) and recheck.

   NO – Intermittent failure

DTC 54 (BANK ANGLE SENSOR)

- Before starting the inspection, check for loose or poor contact on the bank angle sensor 3P (Black) connector and PCM/ECM 33P connectors, and recheck the DTC.



Probable cause
- Open circuit in Brown/white wire between the bank angle sensor and PCM/ECM
- Open or short circuit in Black/green wire between the bank angle sensor and PCM/ECM
- Open circuit in Green/white wire between the bank angle sensor and PCM/ECM
- Faulty bank angle sensor
- Faulty PCM/ECM

DTC 54-1 (BANK ANGLE SENSOR LOW VOLTAGE)

1. **Recheck DTC**

   Erase the DTCs (page 4-14).

   Check the bank angle sensor with the MCS.

   Is about 0 V indicated?

   YES – GO TO STEP 2.

   NO – • Intermittent failure.
   • Loose or poor contact of the bank angle sensor 3P (Black) connector.

2. Bank Angle Sensor Power Input Voltage Inspection

Disconnect the bank angle sensor 3P (Black) connector (page 4-43).
Turn the ignition switch ON.

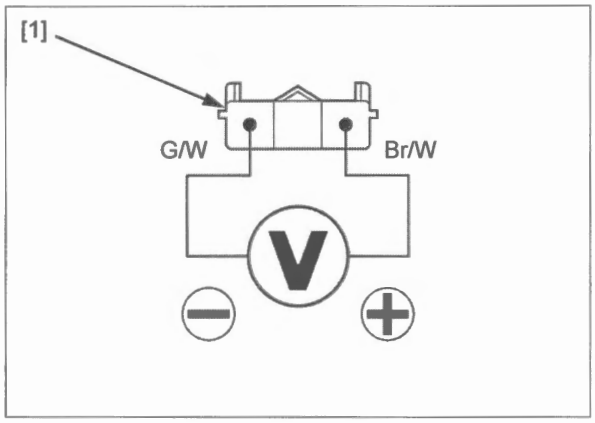
Measure the voltage between the wire harness side bank angle sensor 3P (Black) connector [1] terminals.

Connection: Brown/white (+) – Green/white (–)

Is the voltage within 4.75 – 5.25 V?

YES – GO TO STEP 3.

NO – Replace the PCM/ECM with a known good one (page 4-45), and recheck.



3. Bank Angle Sensor Output Line Short Circuit Inspection

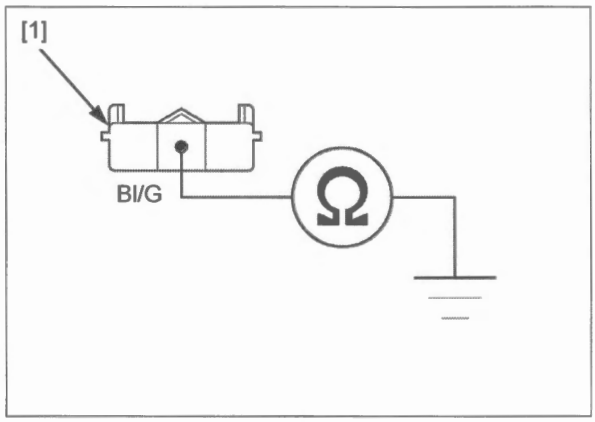
Check for continuity between the wire harness side bank angle sensor 3P (Black) connector [1] terminal and ground.

Connection: Black/green – Ground

Is there continuity?

YES – Short circuit in the Black/green wire.

NO – GO TO STEP 4.



4. Bank Angle Sensor Inspection

Replace the bank angle sensor with a known good one (page 4-43).
Erase the DTCs (page 4-14).

Check the bank angle sensor with the MCS.

Is DTC 54-1 indicated?

YES – Replace the PCM/ECM with a known good one (page 4-45), and recheck.

NO – Faulty original bank angle sensor.

DTC 54-2 (BANK ANGLE SENSOR HIGH VOLTAGE)

1. Recheck DTC

Erase the DTCs (page 4-14).

Check the bank angle sensor with the MCS.

Is about 5 V indicated?

YES – GO TO STEP 2.

NO – • Intermittent failure.
• Loose or poor contact of the bank angle sensor 3P (Black) connector.

2. Bank Angle Sensor Inspection

Disconnect the bank angle sensor 3P (Black) connector (page 4-43).

Connect the wire harness side bank angle sensor 3P (Black) connector [1] terminals with a jumper wire [2].

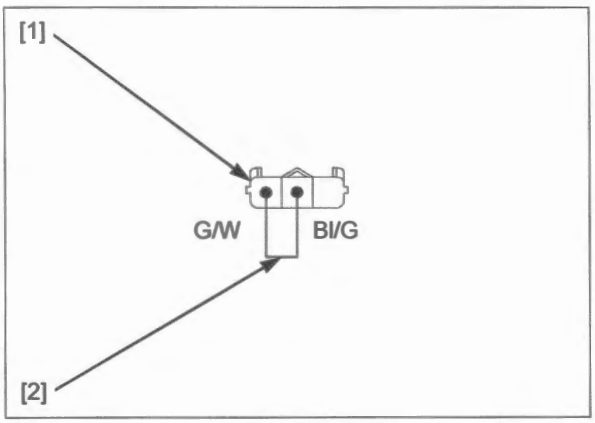
Connection: Black/green – Green/white

Check the bank angle sensor with the MCS.

Is about 0 V indicated?

YES – GO TO STEP 3.

NO – GO TO STEP 4.



3. Bank Angle Sensor Power Input Voltage Inspection

Turn the ignition switch OFF.
Remove the jumper wire.
Turn the ignition switch ON.

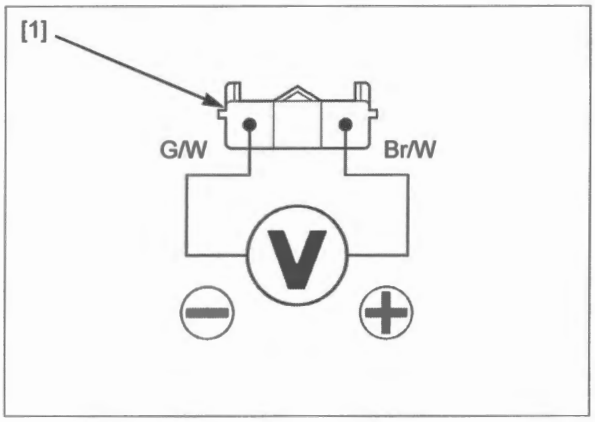
Measure the voltage between the wire harness side bank angle sensor 3P (Black) connector [1] terminals.

Connection: Brown/white (+) – Green/white (–)

Is the voltage within 4.75 – 5.25 V?

YES – Inspect the bank angle sensor (page 4-44).

NO – Open circuit in the Brown/white wire.



4. Bank Angle Sensor Each Line Open Circuit Inspection

Disconnect the PCM/ECM 33P (Gray) connector (page 4-45).

Check for continuity between the wire harness side bank angle sensor 3P (Black) connector [1] and PCM/ECM 33P (Gray) connector [2] terminals.

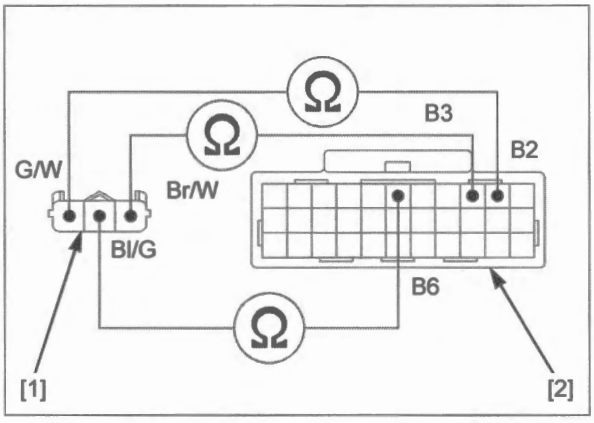
Connection: B6 – Black/green
B2 – Green/white
B3 – Brown/white

TOOL:
Pin Probe Male (2 pack) **07ZAJ-RDJA110**

Is there continuity?

YES – Replace the PCM/ECM with a known good one (page 4-45), and recheck.

NO – • Open circuit in the Black/green wire.
• Open circuit in the Green/white wire.
• Open circuit in the Brown/white wire.



MIL CIRCUIT INSPECTION

NOTE:

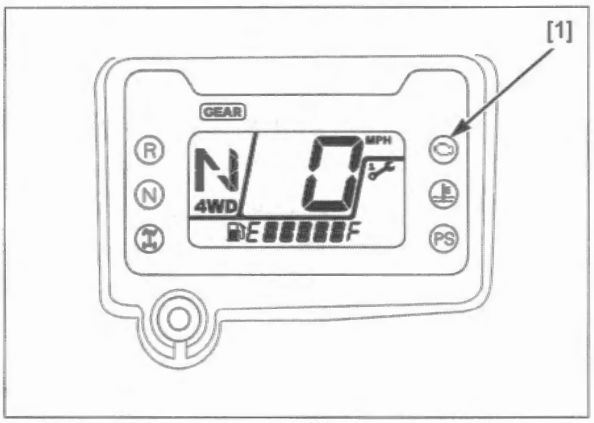
- Under normal conditions, the MIL will stay on for a few seconds, then goes off when the ignition switch is turned on.

Check that the MIL [1] comes on when the ignition switch is turned ON.

If the MIL does not come on at all, inspect the combination meter (page 24-7).

If the MIL comes on with the gear position indicator continuously blinking "–", check the serial communication line (page 24-9).

If the MIL does not go off within a few seconds comes on and it, check as follows:

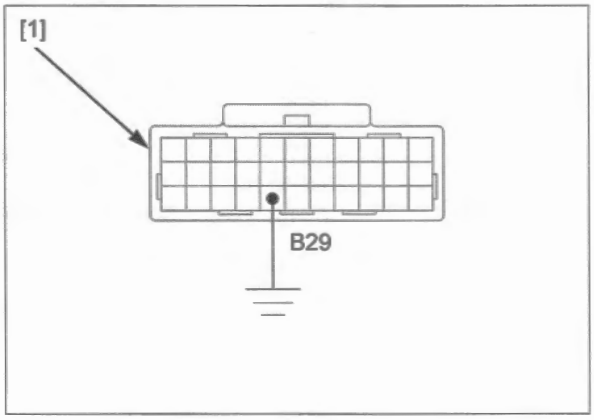


Disconnect the PCM/ECM 33P (Gray) connector (page 4-45).

Check for continuity between the wire harness side PCM/ECM 33P (Gray) connector [1] terminal and ground.

Connection: B29 – Ground

TOOL:
Pin Probe Male (2 pack) 07ZAJ-RDJA110



- If there is continuity, check for short circuit in the Brown/red wire between the DLC and PCM/ECM.
- If there is no continuity, replace the PCM/ECM with a known good one (page 4-45), and recheck.

SENSOR UNIT (MAP/TP SENSOR)

REMOVAL/INSTALLATION

NOTE:

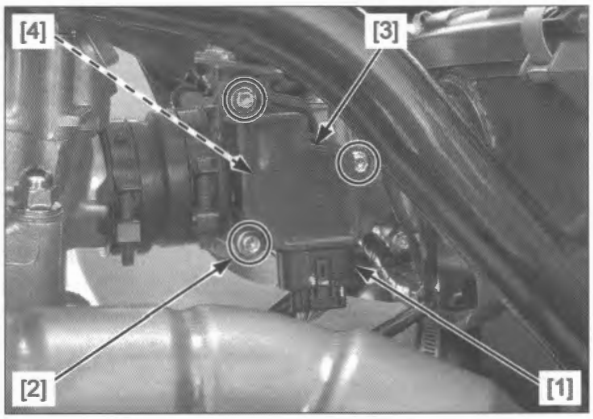
- If the sensor unit has been removed, perform the TP sensor reset procedure (page 4-42).
- Always clean around the throttle body before the sensor unit removal to prevent dirt and debris from entering the air passage.

Remove the tank cover assembly (page 2-4)

Turn the ignition switch OFF.

Disconnect the sensor unit 5P (Black) connector [1].

Remove the torx screws (T25) [2], sensor unit [3] and O-ring [4] from the throttle body.



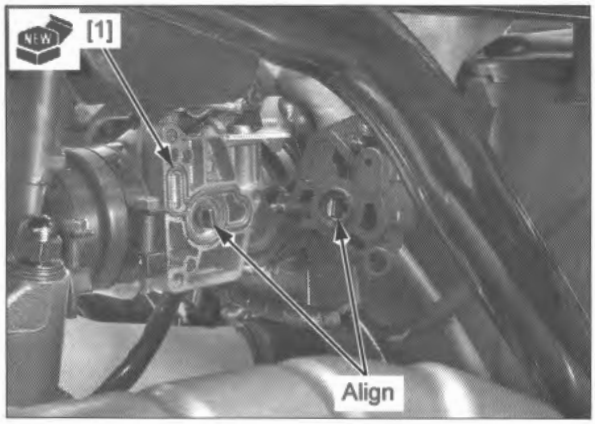
Installation is in the reverse order of removal.

- Always replace the O-ring [1] with a new one.
- Align the slot of the sensor unit with the throttle shaft end.

TORQUE:

Sensor unit torx screw (T25):
3.4 N·m (0.3 kgf·m, 2.5 lbf·ft)

Perform the TP sensor reset procedure (page 4-42).



TP SENSOR RESET PROCEDURE

NOTE:

- Make sure that the DTC is not stored in the PCM/ ECM memory. If the DTC is stored, the reset mode will not start.

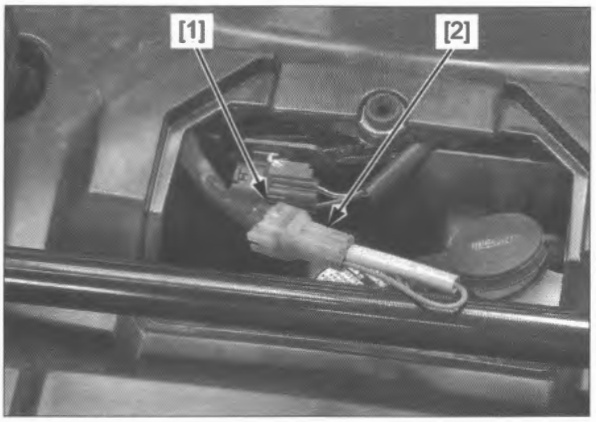
1. Remove the following:

– radiator cap lid (page 2-3)
– tank cover assembly (page 2-4)

2. Turn the ignition switch OFF.
3. Disconnect the DLC from the accessory socket sub harness 4P (Red) connector (page 4-13).
4. Short the DLC [1] terminals using the special tool.

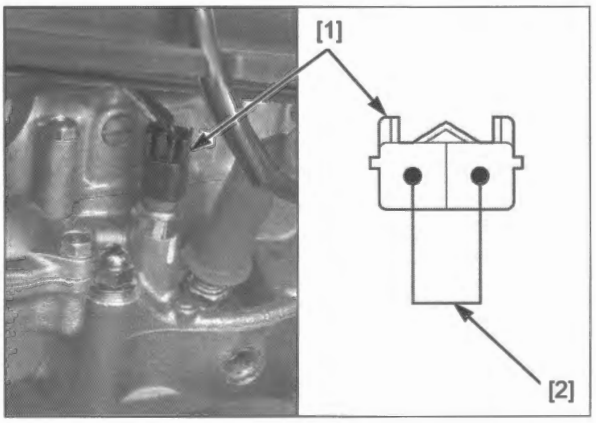
   Connection: Brown/red – Green

   TOOL:
   [2] SCS service connector 070PZ-ZY30100



5. Disconnect the ECT sensor 2P (Black) connector [1].

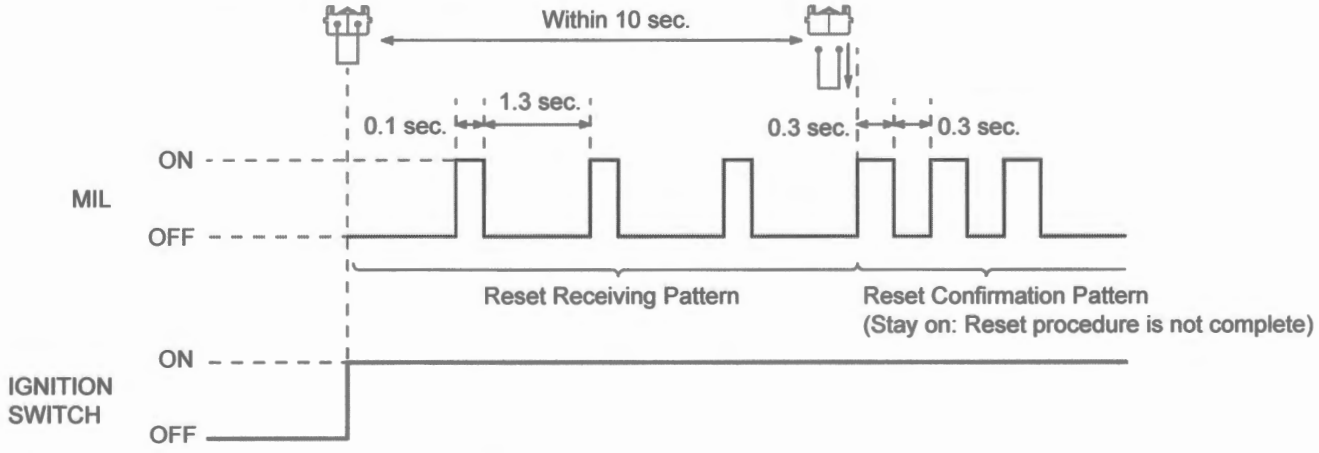
   Connect the wire harness side ECT sensor 2P (Black) connector terminals with a jumper wire [2].



6. Turn the ignition switch ON, then remove the jumper wire from the ECT sensor 2P (Black) connector within 10 seconds while the MIL is blinking (reset receiving pattern).
7. When the reset procedure is complete, the MIL blinking changes from Reset Receiving Pattern to Confirmation Pattern.

   Turn the ignition switch OFF.

   If more than 10 seconds elapse or the procedures are incorrect, the MIL stays on. Repeat the reset procedures from the step 4.



8. Connect the ECT sensor 2P (Black) connector.
9. Disconnect the special tool from the DLC.
10. Check the engine idle speed (page 3-15).
11. Install the removed parts in the reverse order of removal.

ECT SENSOR

REMOVAL/INSTALLATION

Drain the coolant (page 8-5).

Turn the ignition switch OFF.

Disconnect the spark plug cap [1] and ECT sensor 2P (Black) connector [2].

Replace the ECT sensor while the engine is cold.

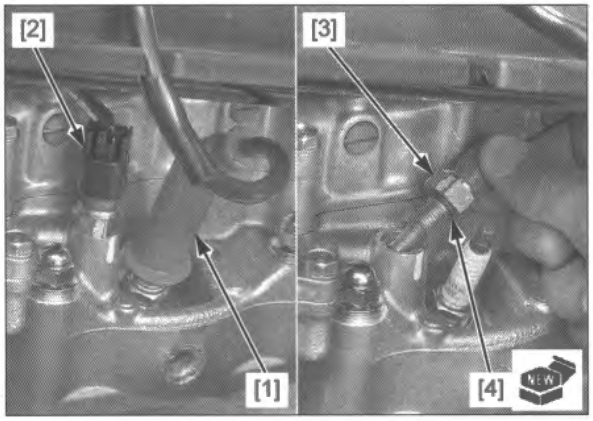
Remove the ECT sensor [3] and O-ring [4].

Installation is in the reverse order of removal.

- Always replace the O-ring with a new one.

TORQUE:
ECT sensor:
12 N·m (1.2 kgf·m, 9 lbf·ft)

Fill the cooling system with recommended coolant (page 8-5).



BANK ANGLE SENSOR

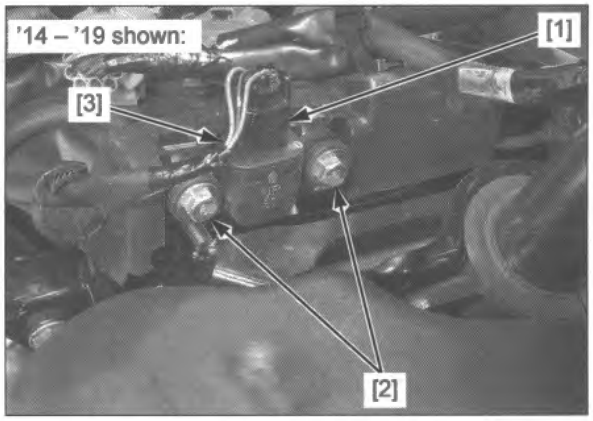
REMOVAL/INSTALLATION

Remove the front fender/carrier (page 2-8).

Turn the ignition switch OFF.

Disconnect the bank angle sensor 3P (Black) connector [1].

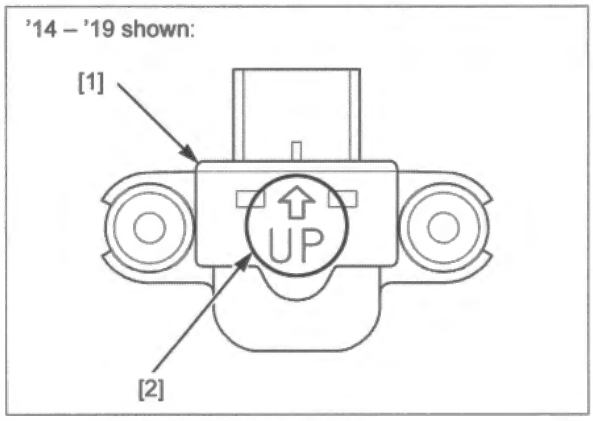
Remove the mounting bolts [2] and bank angle sensor [3] from the front connector stay.



Install the bank angle sensor [1] with its "UP" mark [2] facing up.

Install the removed parts in the reverse order of removal.

TORQUE:
Bank angle sensor mounting bolt:
10 N·m (1.0 kgf·m, 7 lbf·ft)



OPERATION INSPECTION

Remove the bank angle sensor [1] with the bank angle sensor 3P (Black) connector is connected (page 4-43).

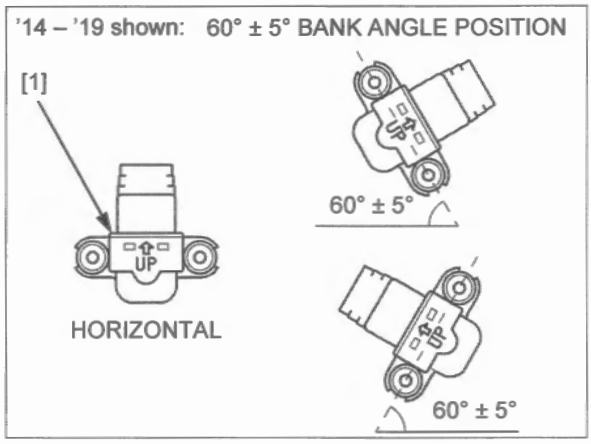
- Do not disconnect the bank angle sensor 3P (Black) connector during inspection.

Place the bank angle sensor horizontally (normal position) as shown, and turn the ignition switch ON.

Start the engine.

Incline the bank angle sensor 60° ± 5° to the left or right while keeping the engine running.

The bank angle sensor is normal if the engine stops after a few seconds when the bank angle sensor inclined.



INSPECTION WITH MCS

Connect the MCS (page 4-13).

Remove the bank angle sensor [1] with the bank angle sensor 3P (Black) connector is connected (page 4-43).

- Do not disconnect the bank angle sensor 3P (Black) connector during inspection.

Place the bank angle sensor horizontally (normal position) as shown, and turn the ignition switch ON.

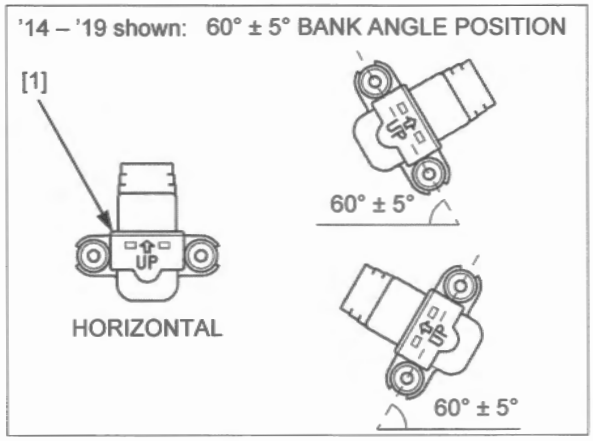
Read the voltage with the MCS.

Standard: 3.6 – 4.4 V

Incline the bank angle sensor 60° ± 5° to the left or right while keeping the ignition switch ON.

Read the voltage with MCS.

Standard: 0.7 – 1.3 V



IAT SENSOR

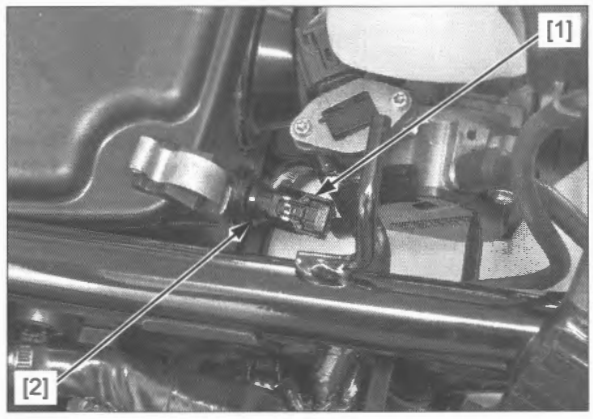
REMOVAL/INSTALLATION

Remove the tank cover assembly (page 2-4).

Turn the ignition switch OFF.

Disconnect the IAT sensor 2P (Black) connector [1] and remove the IAT sensor [2].

Installation is in the reverse order of removal.



PCM/ECM

REMOVAL/INSTALLATION

Remove the tank cover assembly (page 2-4).

Turn the ignition switch OFF.

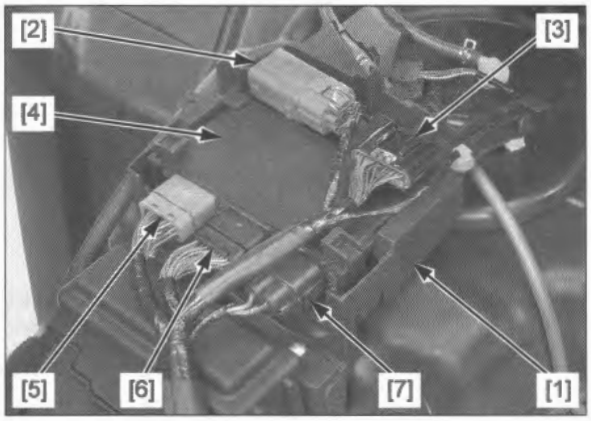
Remove the following from the ECM stay [1]:

- pull back relay [2]
- joint connector 2 [3]
- PCM/ECM [4]

Disconnect the following from the PCM/ECM:

- 33P (Gray) connector [5]
- 33P (Black) connector [6]
- 5P (Black) connector [7]

Installation is in the reverse order of removal.



POWER/GROUND LINE INSPECTION

- Before starting the inspection, check for loose or poor contact on the PCM/ECM 33P (Gray) connector.

1. PCM/ECM Power Line Inspection

Disconnect the PCM/ECM 33P (Gray) connector (page 4-45).
Turn the ignition switch ON.

Measure the voltage between the wire harness side PCM/ECM 33P (Gray) connector [1] terminal and ground.

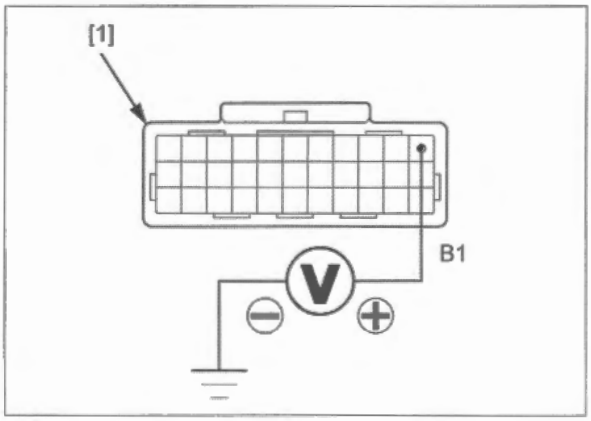
Connection: B1 (+) – Ground (–)

TOOL:
Pin Probe Male (2 pack) **07ZAJ-RDJA110**

Does the battery voltage exist?

YES – GO TO STEP 2.

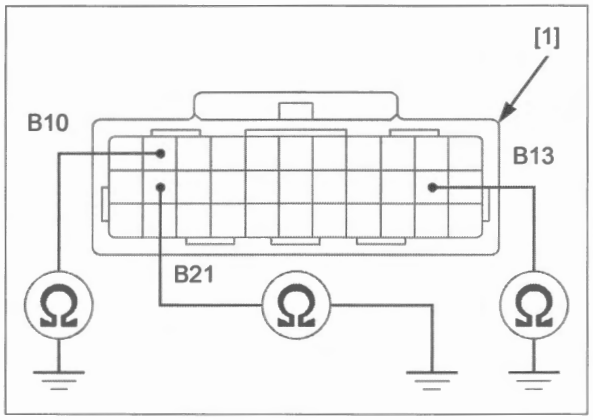
NO –
- discharged battery (page 23-5)
- open circuit in the Red wire between the battery and MAIN 1 fuse (40 A)
- blown MAIN 1 fuse (40 A)
- open circuit in the Red/black wire between the MAIN 1 fuse (40 A) and MAIN 2 fuse (10 A)
- blown MAIN 2 fuse (10 A)
- open circuit in the Red/yellow wire between the MAIN 2 fuse (10 A) and diode
- faulty diode (page 23-8)
- open circuit in the Red wire between the diode and ignition switch
- ignition switch (page 24-13)
- open circuit in the Black wire between the ignition switch and IGN fuse (20 A)
- blown IGN fuse (20 A)
- open circuit in the Black/red wire between the IGN fuse (20 A) and PCM/ECM



2. PCM/ECM Ground Line Inspection

Turn the ignition switch OFF.
Check for continuity between the wire harness side PCM/ECM 33P (Gray) connector [1] terminal and ground.

Connection: B10 – Ground
B13 – Ground
B21 – Ground



TOOL:
Pin Probe Male (2 pack) 07ZAJ-RDJA110

Is there continuity?

YES – Replace the PCM/ECM with a known good one (page 4-45), and recheck.

NO – Open circuit in the Green wire.

ENGINE STOP SWITCH LINE INSPECTION

- Before starting the inspection, check for loose or poor contact on the PCM/ECM 33P (Black) and (Gray) connectors.

ENGINE DOES NOT START (NO FUEL PUMP OPERATION SOUND)

1. Fuse Inspection

Check for a blown IGN fuse (20 A).

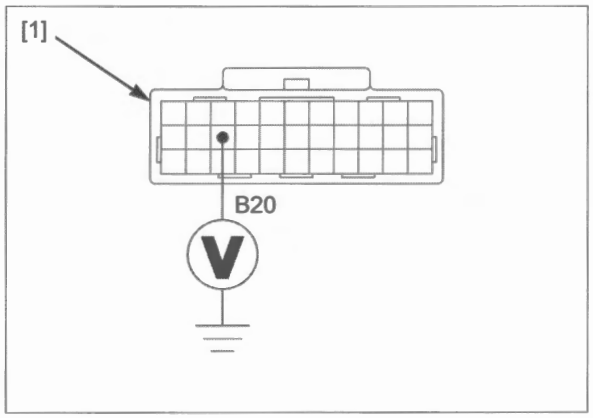
Is the fuse blown?

YES – Replace the fuse.

NO – GO TO STEP 2.

2. Engine Stop Switch Line Inspection

Disconnect the PCM/ECM 33P (Gray) connector (page 4-45).
Turn the ignition switch ON and engine stop switch "○".



Measure the voltage between the wire harness side PCM/ECM 33P (Gray) connector [1] terminal and ground.

Connection: B20 (+) – Ground (–)

TOOL:
Pin Probe Male (2 pack) 07ZAJ-RDJA110

Does the battery voltage exist?

YES –
- Inspect the fuel supply system (page 7-6).

NO –
- Open circuit in the Gray/red wire between the fuel pump relay and PCM/ECM.
- Open circuit in the Black/white wire between the fuel pump relay and engine stop switch.
- Inspect the fuel pump relay (page 7-12).
- Open circuit in the Black/red wire between the fuse box and engine stop switch.
- Inspect the engine stop switch (page 24-15).
- Open circuit in the Black wire between the ignition switch and fuse box.
- Inspect the ignition switch (page 24-13).

O_2 SENSOR

NOTICE

- *Do not get grease, oil or other materials in the O_2 sensor air hole.*
- *The O_2 sensor may be damaged if dropped. Replace it with a new one, if dropped.*

NOTE:

- Do not service the O_2 sensor while it is hot.
- Do not use an impact wrench while removing or installing the O_2 sensor, or it may be damaged.

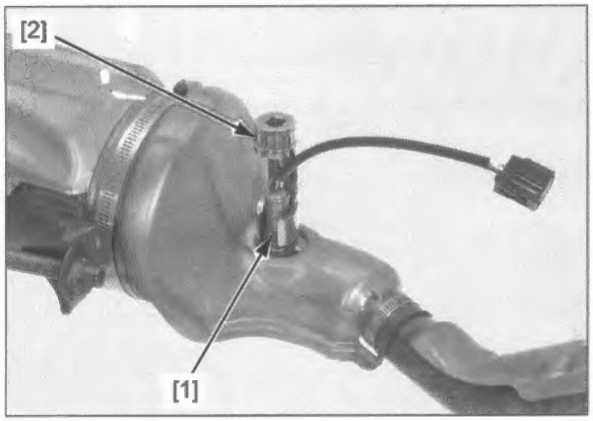
Remove the exhaust system (page 2-16).

Remove the O_2 sensor [1] using the special tool.

TOOL:
[2] FRXM17 (Snap on) or equivalent

Installation is in the reverse order of removal.

TORQUE:
O_2 sensor:
24.5 N·m (2.5 kgf·m, 18 lbf·ft)



MEMO

5. IGNITION SYSTEM

SERVICE INFORMATION 5-2
TROUBLESHOOTING 5-3
COMPONENT LOCATION 5-4
SYSTEM DIAGRAM 5-4
IGNITION SYSTEM INSPECTION 5-5
IGNITION COIL 5-7
IGNITION TIMING 5-7
CONDENSER (Canada type) 5-8

SERVICE INFORMATION

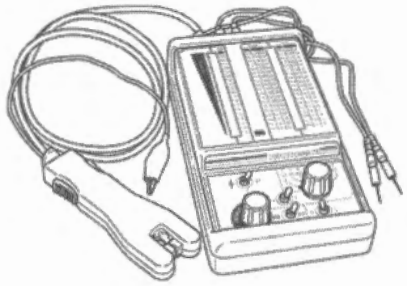
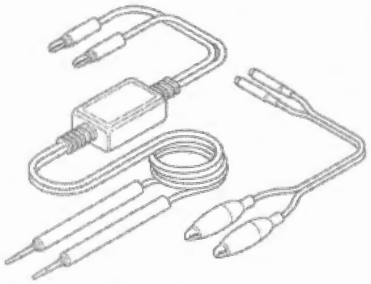
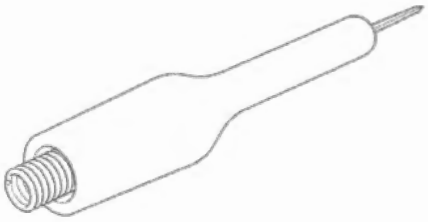
GENERAL

NOTICE

- *The PCM/ECM may be damaged if dropped. Also, if the connector is disconnected when current is flowing, the excessive voltage may damage the PCM/ECM. Always turn off the ignition switch before servicing.*
- *Use spark plugs of the correct heat range. Using spark plugs with an incorrect heat range can damage the engine.*
- Some electrical components may be damaged if terminals or connectors are connected or disconnected while the ignition switch is ON and current is present.
- When servicing the ignition system, always follow the checks described in the troubleshooting chart (page 5-3).
- This ignition system is controlled by PCM/ECM.
- The transistorized ignition system uses an electrically controlled ignition timing system. No adjustments can be made to the ignition timing.
- A faulty ignition system is often related to poor connections. Check those connections before proceeding.
- Make sure the battery is adequately charged. Using the starter motor with a weak battery results in a slower engine cranking speed as well as no spark at the spark plug.
- The engine stop switch line is connected to the PCM/ECM on this vehicle. Its signal permits the PCM/ECM to control the fuel pump, fuel injector and ignition coil.
- Refer to each section for the following components information.
  - CKP sensor (page 15-8).
  - Ignition switch (page 24-13).
  - Engine stop switch (page 24-15).
- The following color codes are used throughout this section.

Bl = Black	Bu = Blue	Gr = Gray	O = Orange	R = Red	W = White
Br = Brown	G = Green	Lg = Light green	P = Pink	Lb = Light blue	Y = Yellow
V = Violet					

TOOLS

IgnitionMate peak voltage tester MTP07-0286 (U.S.A. only) 	Peak voltage adaptor 07HGJ-0020100  (not available in U.S.A.) with commercially available digital multimeter (impedance 10 MΩ/DCV minimum)	Pin Probe Male (2 pack) 07ZAJ-RDJA110 

TROUBLESHOOTING

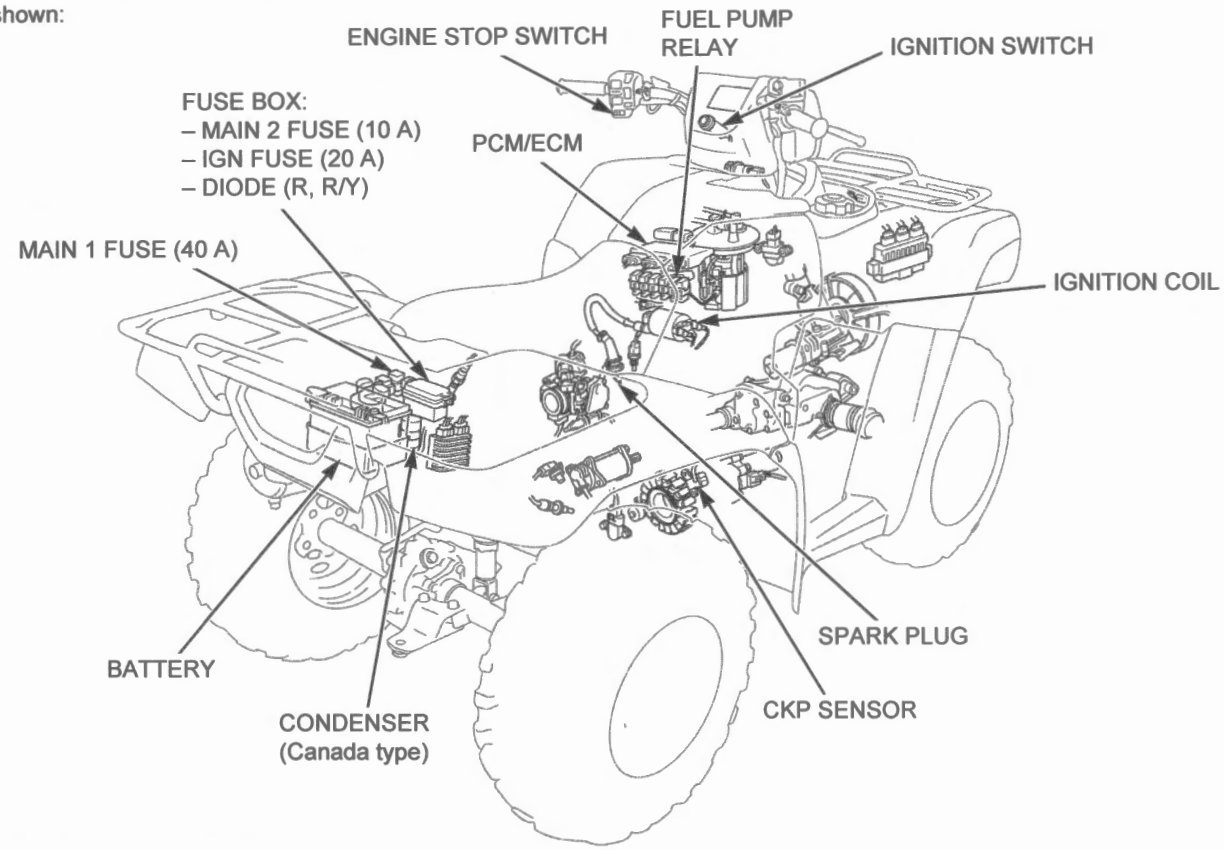
- Inspect the following before diagnosing the system:
  - Faulty spark plug
  - Loose spark plug cap or spark plug wire connection
  - Water got into the spark plug cap (leaking the ignition coil secondary voltage)
- "Initial voltage" of the ignition primary coil is the battery voltage with the ignition switch turned ON. (The engine is not cranked by the starter motor)

No spark at spark plug

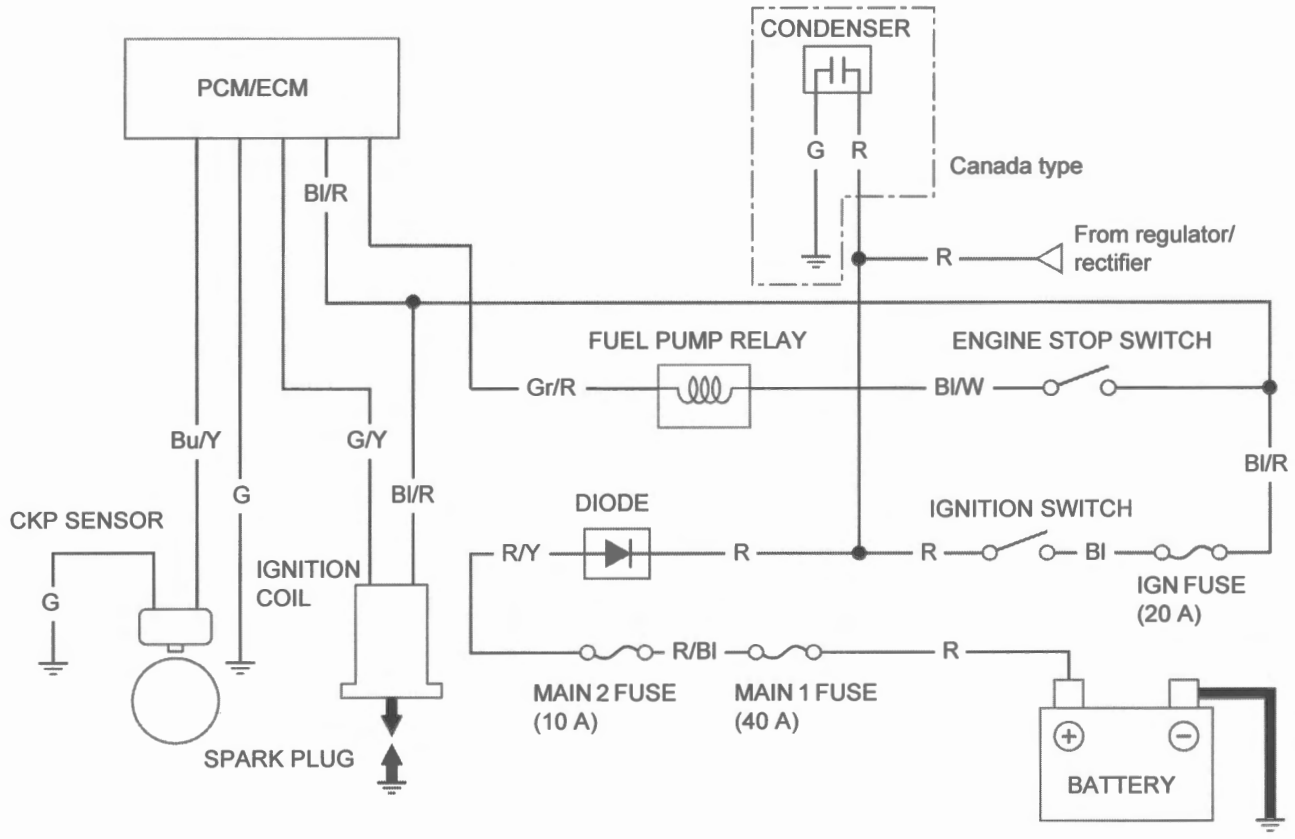
UNUSUAL CONDITION		PROBABLE CAUSE (Check in numerical order)
Ignition coil primary voltage	No initial voltage with the ignition switch turned ON. (Other electrical components are normal.)	1. Faulty ignition switch. 2. An open circuit in the Black/red wire between the ignition coil and ignition switch. 3. Loose or poor connection of the primary terminal, or an open circuit in the primary coil. 4. Faulty PCM/ECM (in case when the initial voltage is normal with the PCM/ECM (Gray) connector disconnected).
	Initial voltage is normal, but it drops by 2 – 4 V while cranking the engine.	1. Incorrect peak voltage adaptor connections. (System is normal if measured voltage is over the specifications with reverse connections) 2. Battery is undercharged. (Voltage drops largely when the engine is started) 3. No voltage at the Green/yellow wire of the PCM/ECM (Gray) connector, or loose or poorly connected PCM/ECM (Gray) connector. 4. Loose or poor connection, or an open circuit in the Green (ground) wire of the PCM/ECM. 5. Loose or poor connection, or an open circuit in the Green/yellow wire between the ignition coil and PCM/ECM. 6. A short circuit in the ignition primary coil. 7. No voltage at the Gray/red wire of the PCM/ECM (Gray) connector, or loose or poorly connected PCM/ECM (Gray) connector. 8. Faulty CKP sensor. (Measure the peak voltage) 9. Faulty PCM/ECM (in case when above No. 1 through 9 are normal).
	Initial voltage is normal, but there is no peak voltage while cranking the engine.	1. Incorrect peak voltage adaptor connections. (System is normal if measured voltage is over the specifications with reverse connections) 2. Faulty peak voltage adaptor. 3. Faulty engine stop switch. 4. Faulty CKP sensor. (Measure the peak voltage) 5. Faulty PCM/ECM (in case when above No. 1 and 4 are normal).
	Initial voltage is normal, but peak voltage is lower than the standard value.	1. The multimeter impedance is too low; below 10 MΩ/DCV. 2. Cranking speed is too slow. (Battery is undercharged) 3. The sampling timing of the tester and measured pulse were not synchronized. (System is normal if measured voltage is over the standard voltage at least once) 4. Faulty PCM/ECM (in case when above No. 1 through 3 are normal).
	Initial and peak voltages are normal, but no spark jumps.	1. Faulty spark plug or leaking ignition coil secondary current. 2. Faulty ignition coil.
CKP sensor	Low peak voltage.	1. The multimeter impedance is too low; below 10 MΩ/DCV. 2. Cranking speed is too slow. (Battery is undercharged) 3. The sampling timing of the tester and measured pulse were not synchronized. (System is normal if measured voltage is over the standard voltage at least once) 4. Faulty CKP sensor (in case when above No. 1 through 3 are normal).
	No peak voltage.	1. Faulty peak voltage adaptor. 2. Faulty CKP sensor.

COMPONENT LOCATION

'14 model shown:



SYSTEM DIAGRAM

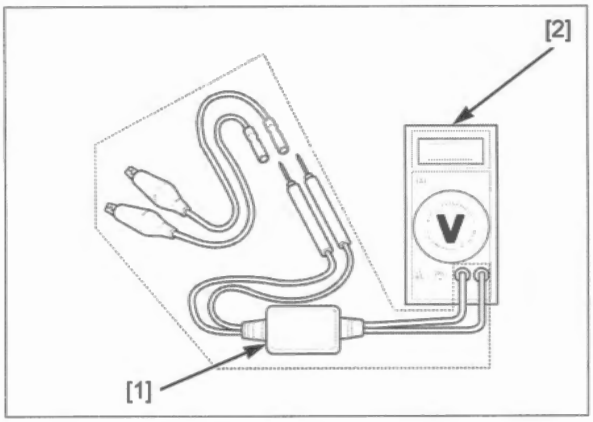


IGNITION SYSTEM INSPECTION

NOTE:

- If there is no spark at the plug, check all connections for loose or poor contact before measuring the peak voltage.
- Use a commercially available digital multimeter with an impedance of 10 MΩ/DCV minimum.
- The display value differs depending upon the internal impedance of the multimeter.

Use the peak voltage tester or connect the peak voltage adaptor [1] to the digital multimeter [2].



TOOLS:

IgnitionMate peak voltage tester	**MTP07-0286 (U.S.A. only) or**
Peak Voltage Adaptor	**07HGJ-0020100 (not available in U.S.A.)**

with commercially available digital multimeter (impedance 10 MΩ/DCV minimum)

IGNITION COIL PRIMARY PEAK VOLTAGE

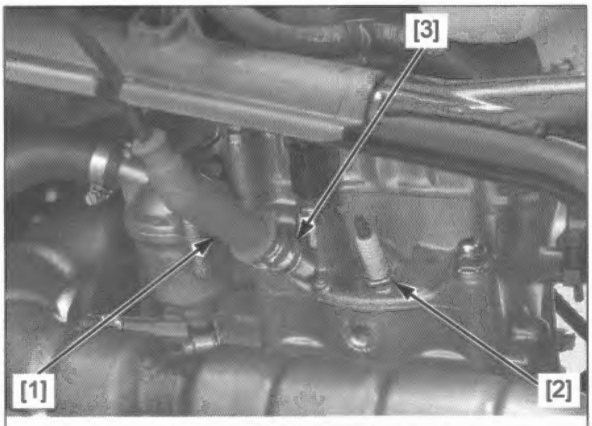
NOTE:

- Check all system connections before this inspection. Poor connected connectors can cause incorrect readings.
- Check that the cylinder compression is normal and the spark plug is installed correctly in the cylinder head.

Remove the tank cover assembly (page 2-4).

Disconnect the spark plug cap [1] from the spark plug [2].

Connect a known good spark plug [3] to the spark plug cap and ground the spark plug to the cylinder head as done in a spark test.



With the connector connected, connect the peak voltage tester or adaptor probes to the ignition coil primary terminals.

Connection: Green/yellow (+) – Ground (–)

Turn the ignition switch ON and engine stop switch "○".
Check the initial voltage at this time.
The battery voltage should be measured.

If the initial voltage cannot be measured, follow the checks in the troubleshooting chart (page 5-3).

Shift the transmission into neutral.

Crank the engine with the starter motor and read the ignition coil primary peak voltage.

PEAK VOLTAGE: 100 V minimum

If the peak voltage is lower than the standard value, follow the checks described in the troubleshooting chart (page 5-3).



CKP SENSOR PEAK VOLTAGE

NOTE:

- Check that the cylinder compression is normal and the spark plug is installed correctly in the cylinder head.

Remove the tank cover assembly (page 2-4).

Seal the PCM/ECM connector with tape to prevent dirt and oil from entering the connector after disconnecting it.

Turn the ignition switch OFF and disconnect the PCM/ECM 33P (Gray) connector [1].

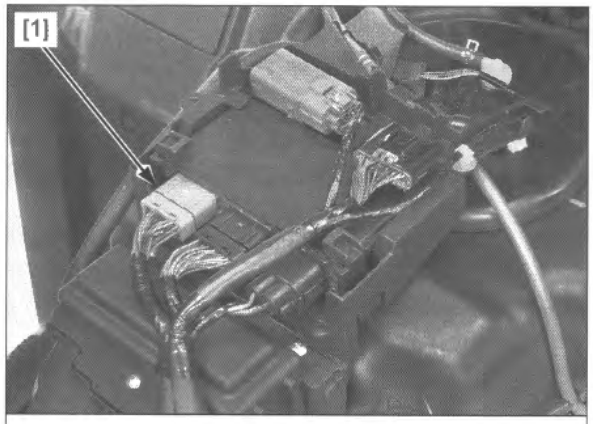
NOTE:

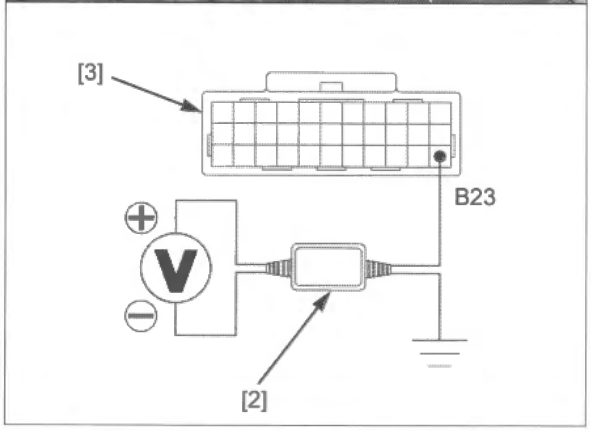
- When reconnecting the PCM/ECM connector, check that there is no dirt and oil in the connector.

Connect the peak voltage tester or adaptor [2] probes to the wire harness side PCM/ECM 33P (Gray) connector [3] terminals

Connection: B23 (Blue/yellow) (+) – Ground (–)

TOOL:
Pin Probe Male (2 pack) 07ZAJ-RDJA110





Shift the transmission into neutral.
Turn the ignition switch ON and engine stop switch "".

Crank the engine with the starter motor and measure the CKP sensor peak voltage.

PEAK VOLTAGE: 0.7 V minimum

If the voltage measured at the PCM/ECM connector is abnormal, measure the peak voltage at the alternator connector.

Remove the air cleaner housing (page 7-18).

'14 – '21 models: Turn the ignition switch OFF and disconnect the CKP sensor 2P (Gray) connector [1].

After' '21 models: Turn the ignition switch OFF and disconnect the CKP sensor 2P (Black) connector [1].

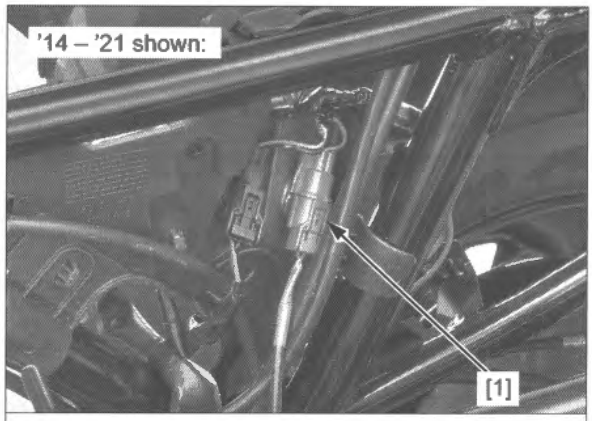
Connect the peak voltage tester or adaptor [2] probes to the CKP sensor side connector terminals.

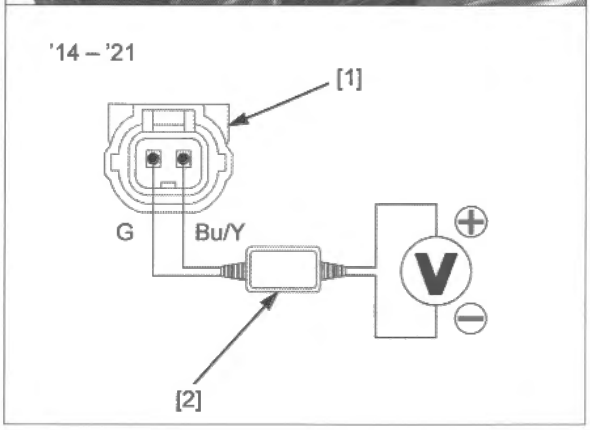
Connection: Blue/yellow (+) – Green (–)

In the same manner as at the PCM/ECM connector, measure the peak voltage and compare it to the voltage measured at the PCM/ECM connector.

- If the peak voltage measured at the PCM/ECM connector is abnormal and the one measured at the CKP sensor connector is normal, the Blue/yellow or Green wire has an open or short circuit, or loose connection.
- If both peak voltages are abnormal, follow the checks described in the troubleshooting chart (page 5-3).

If the CKP sensor is faulty, replace the alternator stator/CKP sensor assembly (page 15-8).





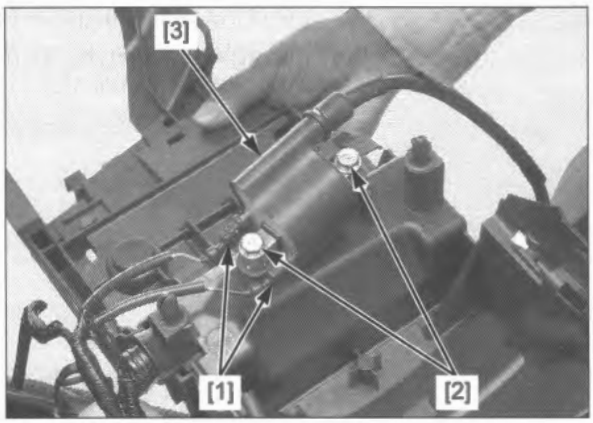
IGNITION COIL

REMOVAL/INSTALLATION

Remove the ECM stay (page 3-8).

Disconnect the ignition coil primary wire connectors [1]. Remove the bolts [2] and ignition coil [3].

Installation is in the reverse order of removal.



IGNITION TIMING

NOTE:

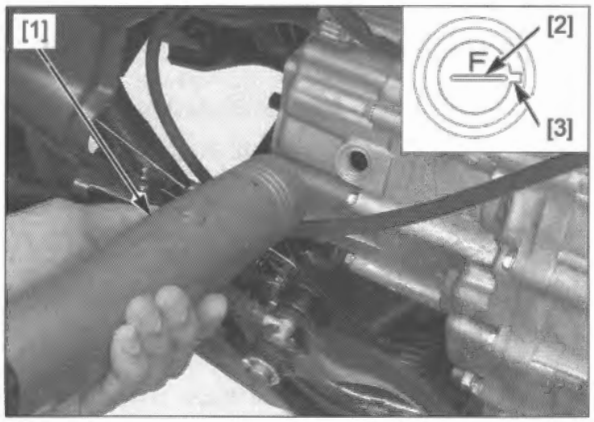
- Before performing this inspection, check the engine idle speed (page 3-15).

Remove the right center mudguard (page 2-5)

Remove the timing hole cap from the rear crankcase cover.
Connect the timing light [1].

Start the engine, let it idle and check the ignition timing.

The ignition timing is correct if the "F" mark [2] on the flywheel aligns with the index mark [3] on the rear crankcase cover at idle.

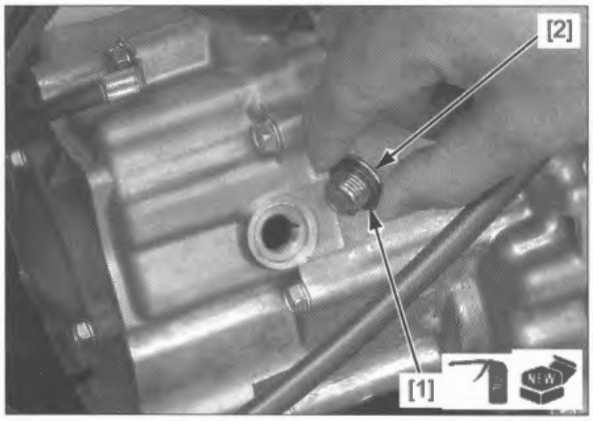


Coat a new O-ring [1] with engine oil and install it onto the timing hole cap [2].

Install and tighten the timing hole cap to the specified torque.

TORQUE: 10 N·m (1.0 kgf·m, 7 lbf·ft)

Install the removed parts in the reverse order of removal.



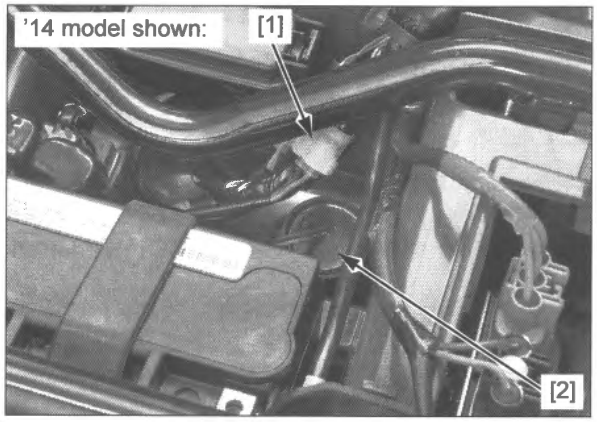
CONDENSER (Canada type)

REMOVAL/INSTALLATION

Disconnect the battery negative (–) cable (page 23-5).

Disconnect the condenser 2P (Natural) connector [1] and remove the condenser [2].

Installation is in the reverse order of removal.



INSPECTION

NOTE:

- Perform this inspection using a fully charged battery.

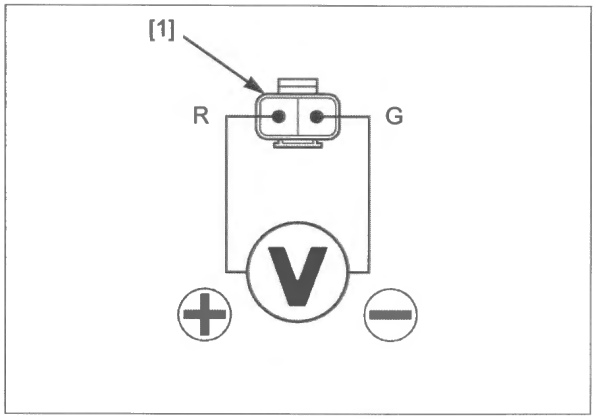
Disconnect the condenser 2P (Natural) connector [1] (page 5-8).

Connect the battery negative (–) cable (page 23-5).

Measure the voltage between the wire harness side condenser 2P (Natural) connector terminals.

Connection: Red (+) – Green (–)

Standard: Battery voltage at all time

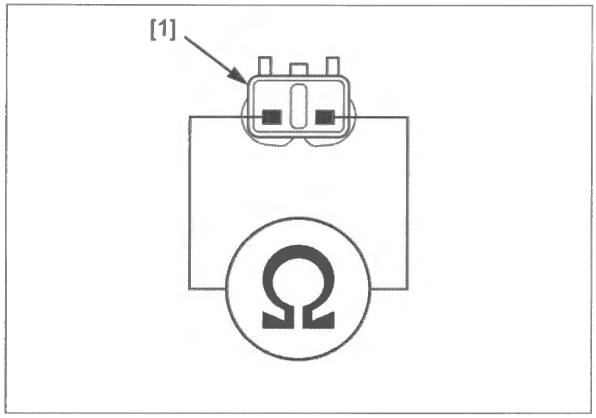


If there is no voltage, check the following:

– main 1 fuse (40 A), main 2 fuse (10 A), diode and/or related circuits
– open circuit in the Red or Green wires

If there is voltage, check the condenser as follows:

1. Disconnect the battery negative (–) cable (page 23-5) and connect the condenser 2P (Natural) connector [1].
2. Connect the battery negative (–) cable for a few seconds and charge the condenser.
3. Disconnect the battery negative (–) cable and discharge the condenser.
4. Disconnect the condenser 2P (Natural) connector and check the resistance between the condenser side connector terminals.



Select the kΩ range of the tester.

The condenser is normal if the resistance comes near 0Ω once and eventually becomes ∞.

If the resistance stays at 0Ω or does not change, replace the condenser.

NOTE:

- If the inspection is interrupted, connect the condenser 2P (Natural) connector and restart the procedure from the step 1.

6. ELECTRIC STARTER

SERVICE INFORMATION 6-2
TROUBLESHOOTING 6-2
COMPONENT LOCATION 6-3
SYSTEM DIAGRAM 6-5
STARTER MOTOR 6-7
STARTER RELAY SWITCH 6-9
DIODE 6-11
IN-GEAR START DIODE (After '14) 6-12

SERVICE INFORMATION

GENERAL

NOTICE

- *If the current is kept flowing through the starter motor to turn it while the engine is not cranking over, the starter motor may be damaged.*

- Always turn the ignition switch OFF before servicing the starter motor. The motor could suddenly start, causing serious injury.
- The starter motor can be serviced with the engine in the frame.
- When checking the starter system, always follow the steps in the troubleshooting (page 6-2).
- A weak battery may be unable to turn the starter motor quickly enough, or supply adequate ignition current.
- Refer to each section for the following components information.
  - Starter clutch (page 15-18)
  - Ignition switch (page 24-13)
  - Engine stop switch and starter/override switch (page 24-15)
  - Front brake inhibitor switch (page 24-15)
  - Gear position switch (page 24-17)
  - CKP sensor (page 5-6)
  - Override inhibitor relay (page 21-23)
- The following color codes are used throughout this section.

Bl = Black	Bu = Blue	Gr = Gray	O = Orange	R = Red	W = White
Br = Brown	G = Green	Lg = Light green	P = Pink	Lb = Light blue	Y = Yellow
V = Violet					

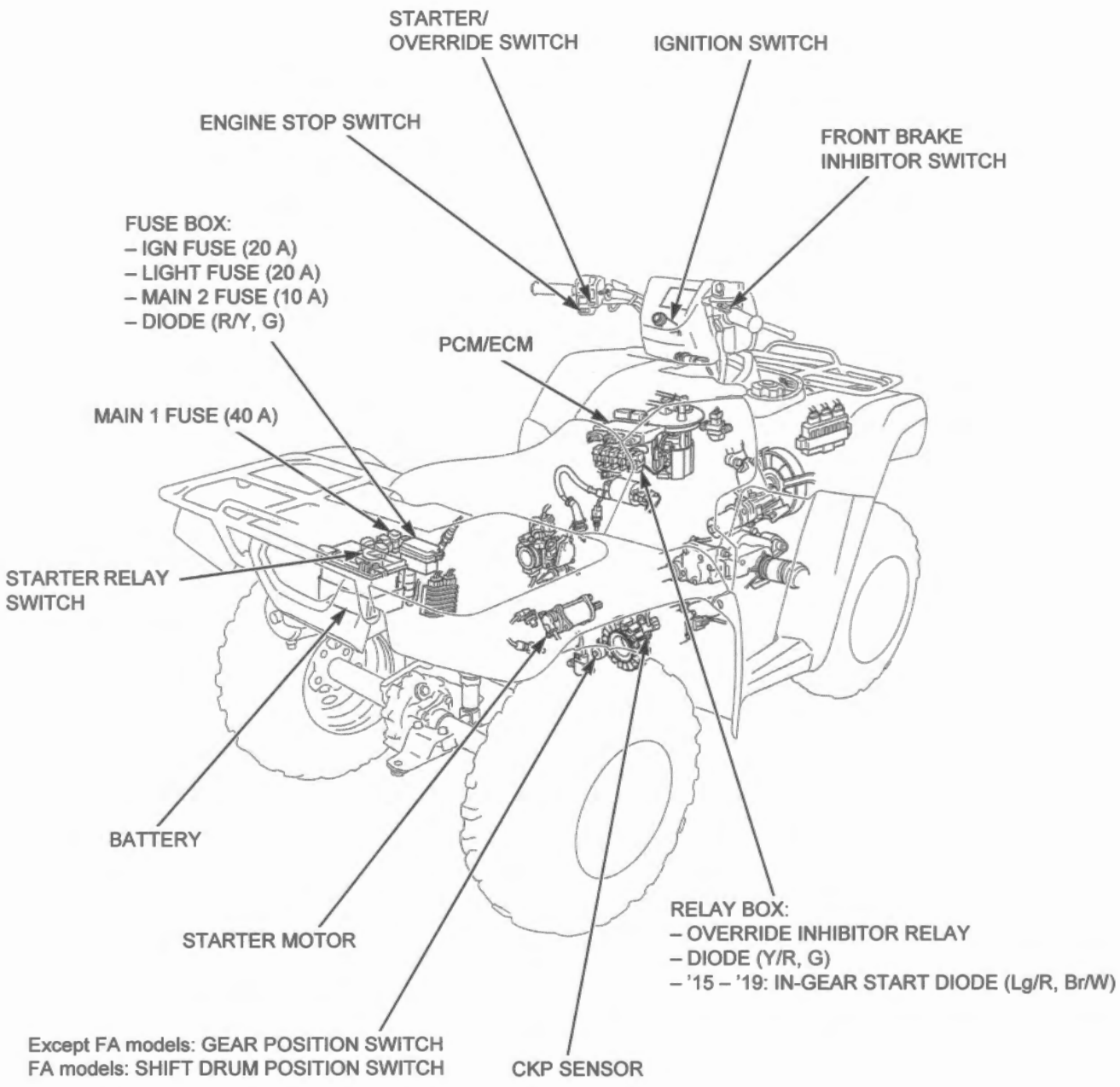
TROUBLESHOOTING

Unusual condition		Probable cause (Check in numerical order)
Starter motor	Starter motor does not turn	1. Weak battery 2. Loose connection or open circuit in the battery cable(s) 3. Loose connection or open circuit in the starter motor cable 4. Faulty starter relay switch (page 6-10) 5. Open circuit in starter relay switch ground circuit (page 6-9) 6. Faulty starter relay switch power input line (page 6-10) – Faulty circuit between the battery and IGN fuse (page 4-45) – Open circuit between the fuse box and engine stop switch – Faulty handlebar switch (engine stop switch and/or starter/override switch) – Open circuit between the starter/override switch and starter inhibitor relay – Faulty override inhibitor relay (page 21-23) or its circuits – Open circuit between the override inhibitor relay and starter relay switch 7. Faulty starter motor 8. FM models: Faulty gear position switch or its circuits '14 – '19 FE models: Faulty gear position switch or its circuits After '19 FE2: Faulty TR sensor or its circuits '15 – '19 FA models: Faulty shift drum position switch or its circuits After '19 FA models: Faulty TR sensor or its circuits 9. After '19 FE/FA models: Faulty neutral switch or its circuits 10. Faulty front brake inhibitor switch or its circuits 11. Faulty PCM/ECM
	Starter motor turns slowly	1. Low battery voltage 2. Poorly connected battery cable terminal(s) 3. Poorly connected starter motor cable 4. Faulty starter motor 5. Poorly connected battery (–) cable ground terminal
	Starter motor turns, but engine does not turn	1. Faulty starter clutch assembly 2. Damaged or faulty starter driven gear 3. Damaged or faulty starter reduction gear 4. Damaged or faulty starter motor pinion gear
	Starter relay switch "Clicks", but engine does not turn over	1. Crankshaft does not turn due to engine problems

COMPONENT LOCATION

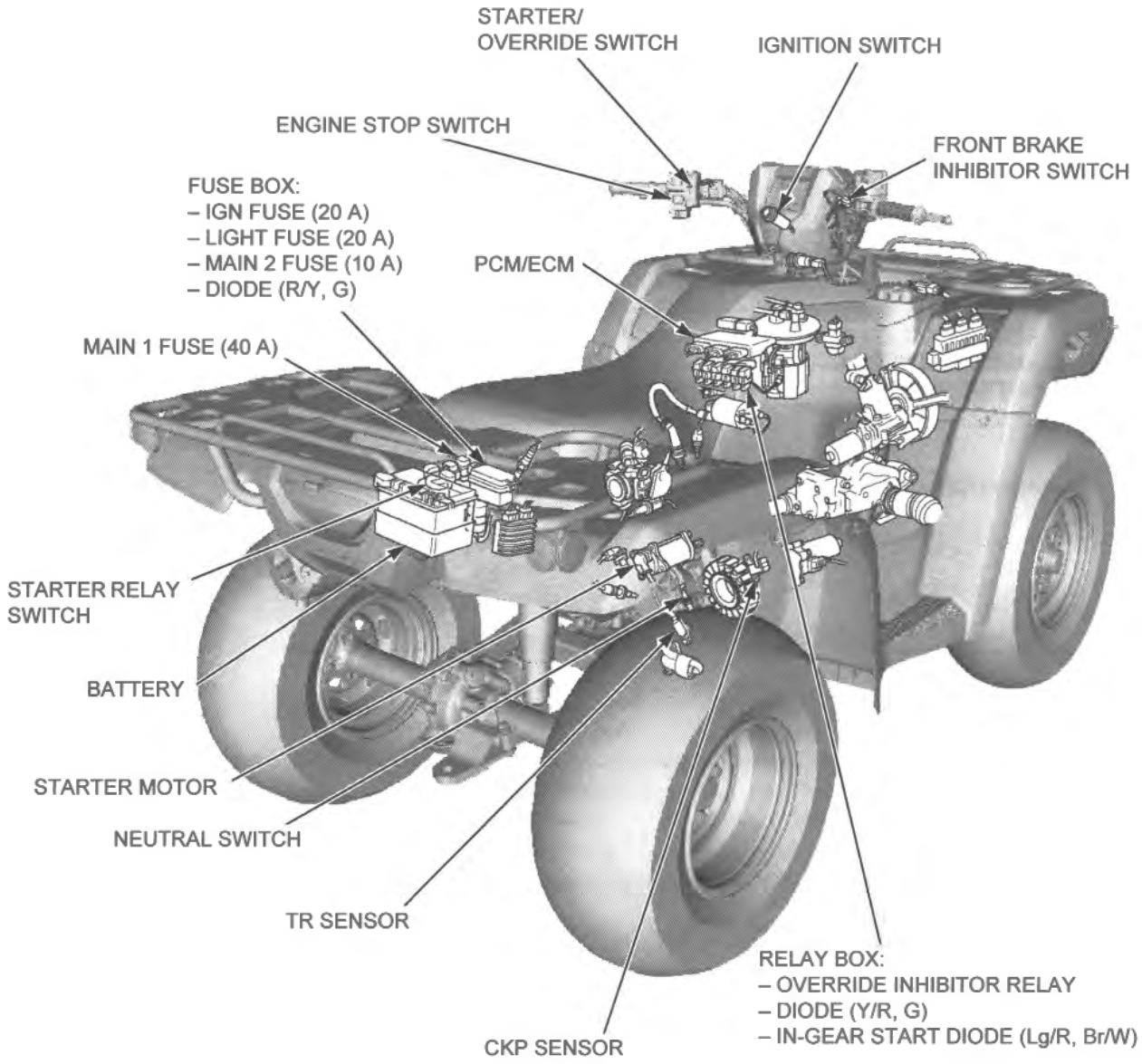
FM models (All)/FE models ('14 –'19)/FA models ('15 –'19):

'14 model shown:



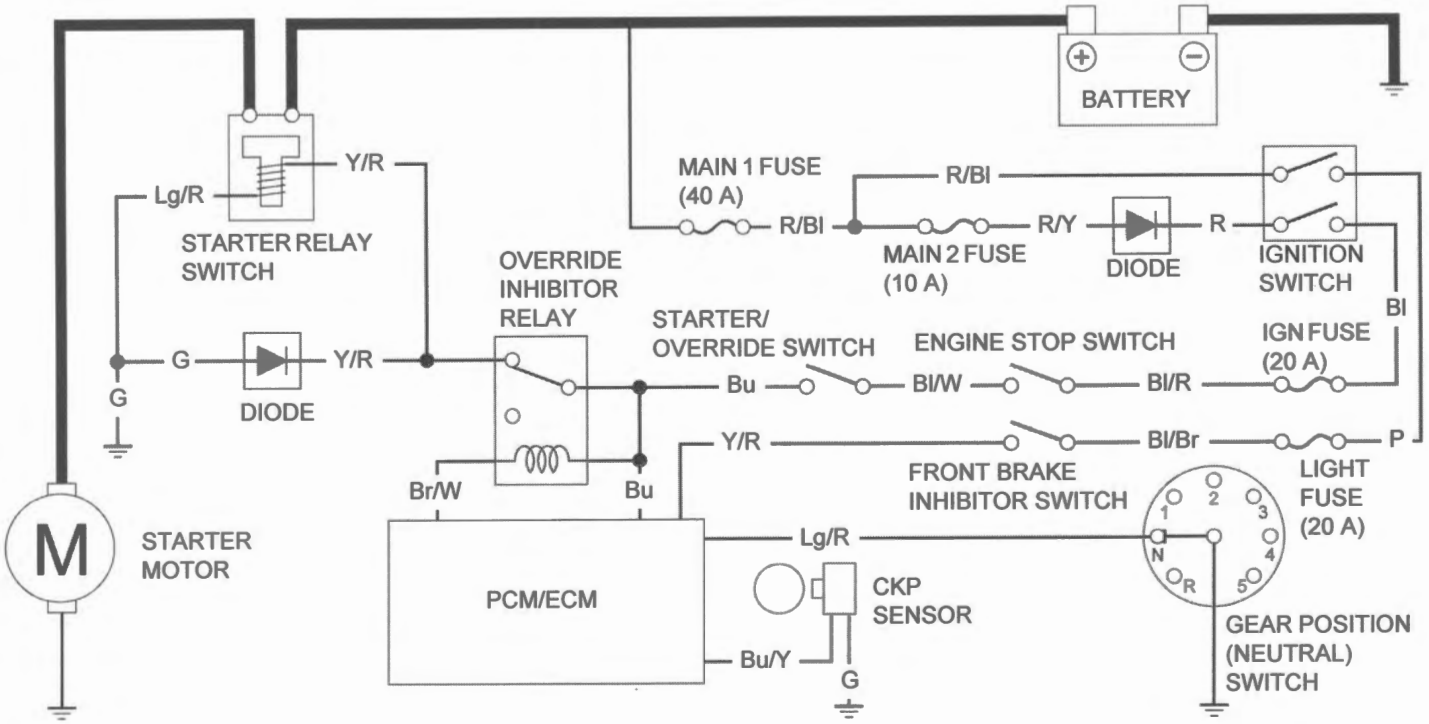
FE2 (After '19)/FA models (After '19):

FE2 ('20 – '21) shown:

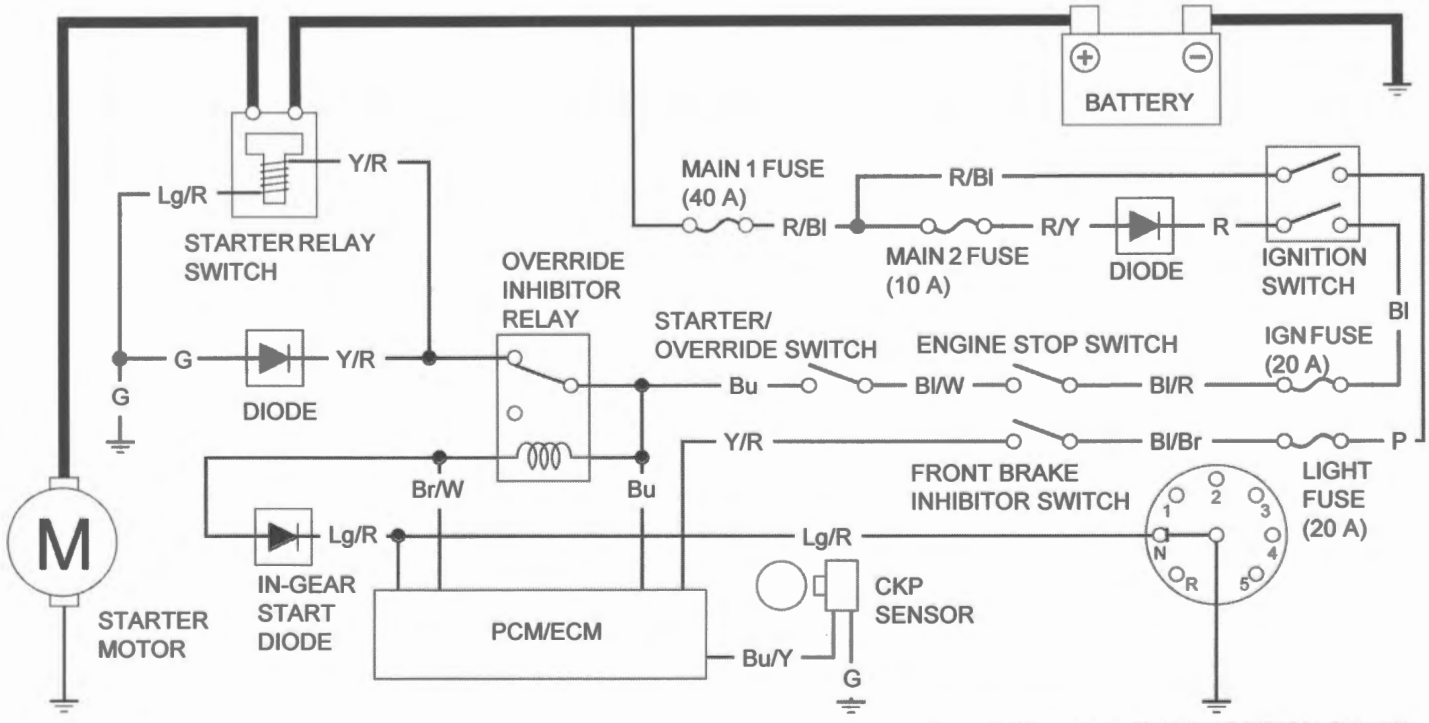


SYSTEM DIAGRAM

FM1/FM2/FE1/FE2 ('14):

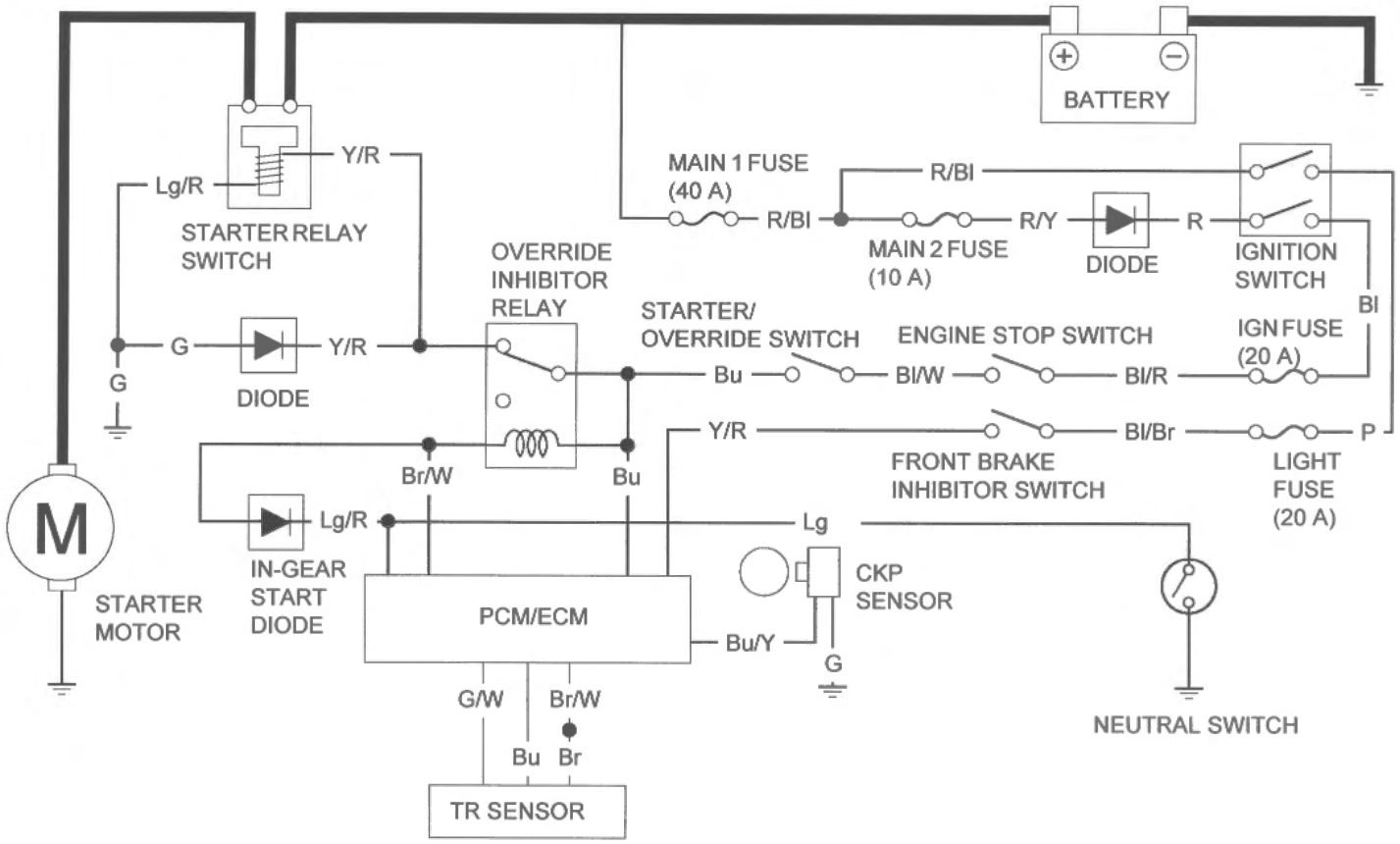


FM1/FM2/FE1 (After '14)/FE2 ('14 – '19)/FM5/FM6/FM7/FA models ('15 – '19):

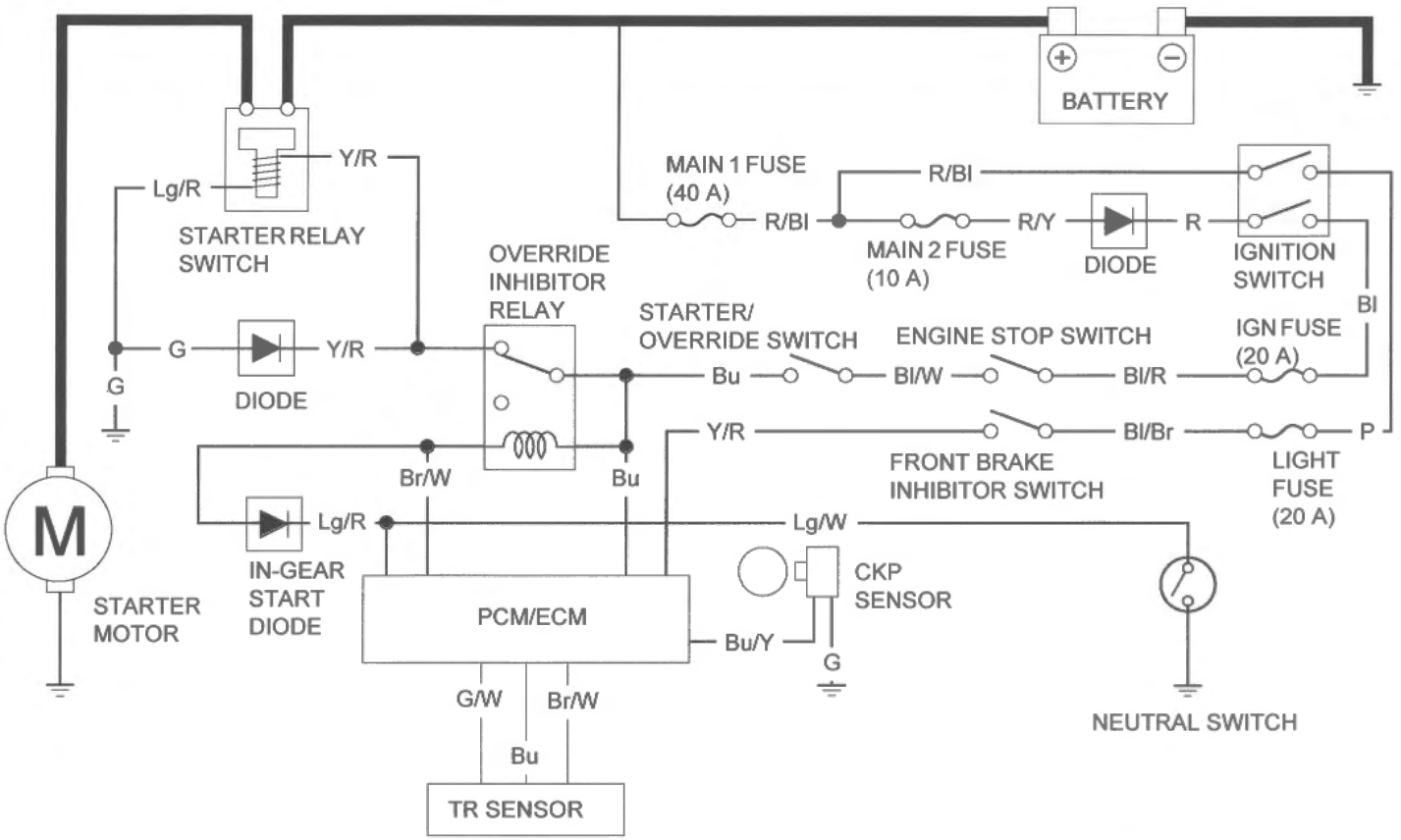


Except FA models: GEAR POSITION SWITCH
FA models: SHIFT DRUM POSITION SWITCH

FE2 (After '19) /FA ('19 – '23) models:



FA models (After '23):



STARTER MOTOR

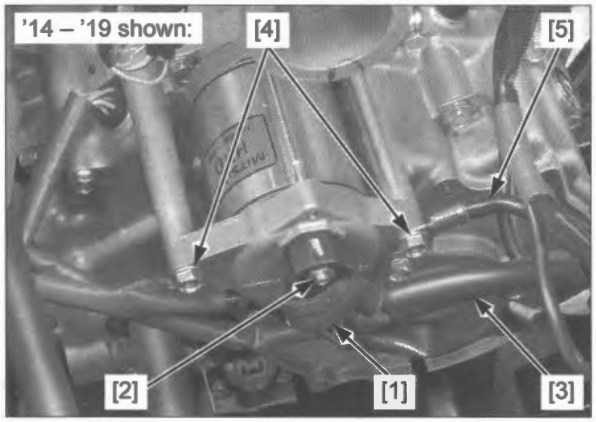
REMOVAL/INSTALLATION

Remove the air cleaner housing (page 7-18).
Disconnect the battery negative (–) cable (page 23-5).

Slide the rubber cap [1]

Remove the following:

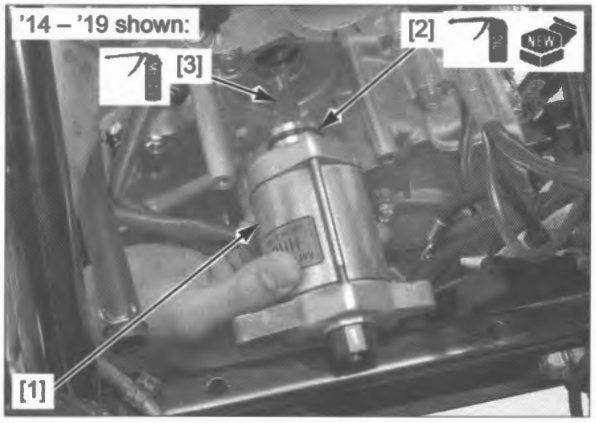
– terminal nut [2] and starter motor cable [3]
– mounting bolts [4] and ground cable [5]



Remove the starter motor [1] from the rear crankcase cover.
Remove the O-ring [2] from the starter motor.

Installation is in the reverse order of removal.

- Always replace the O-ring with a new one.
- Coat a new O-ring with engine oil.
- Apply molybdenum oil solution to the starter motor shaft splines and shaft end [3].
- Route the cables properly (page 1-31).



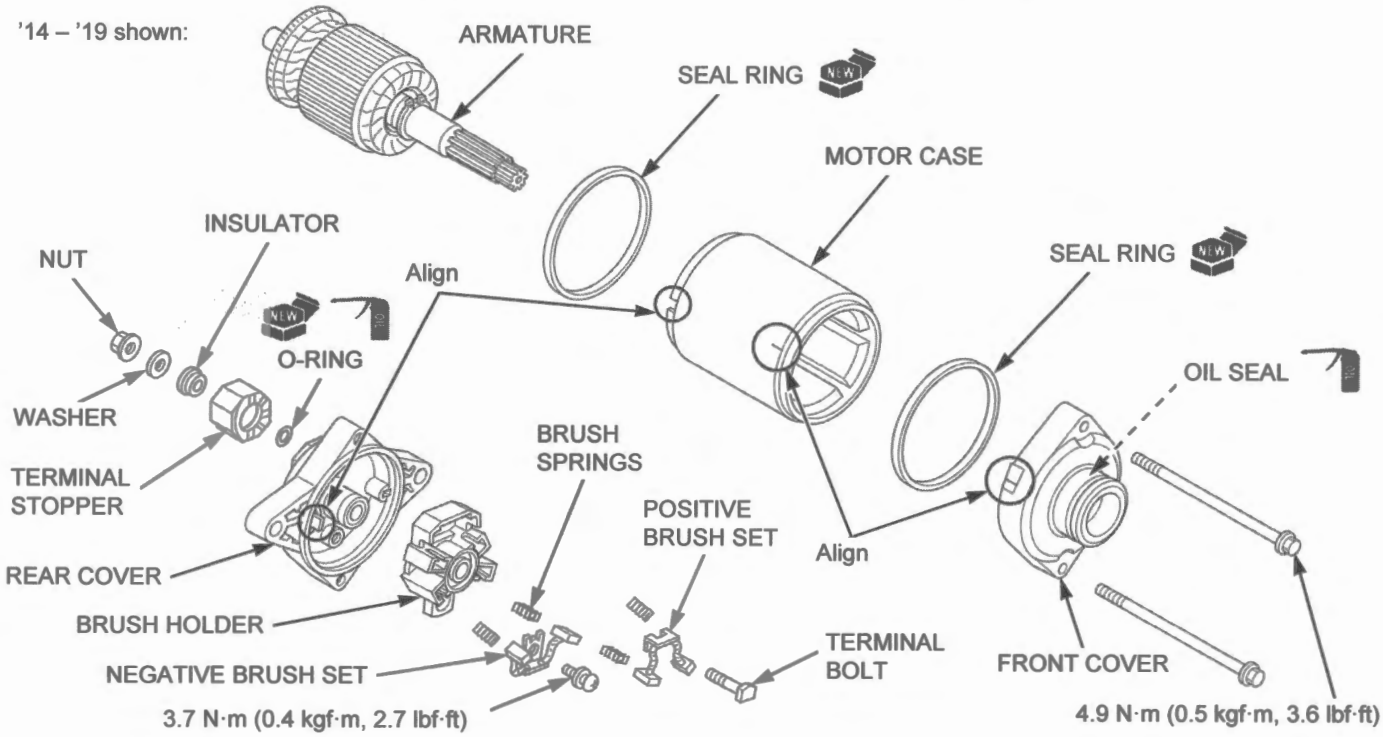
DISASSEMBLY/ASSEMBLY

Disassemble and assemble the starter motor as following illustration.

NOTICE

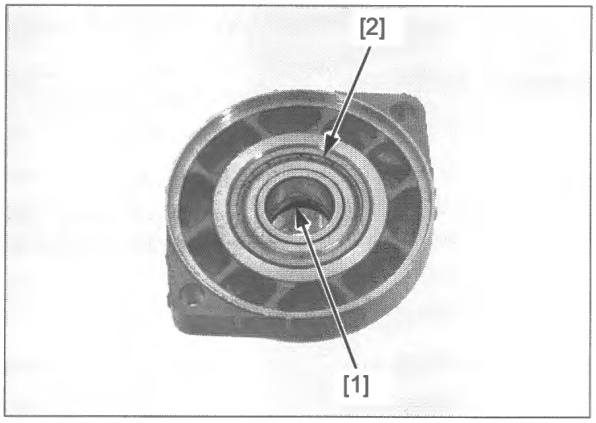
The coil may be damaged if the magnet pulls the armature against the case.

'14 – '19 shown:



INSPECTION

Check the oil seal [1] and ball bearing [2] in the front cover for wear or damage.



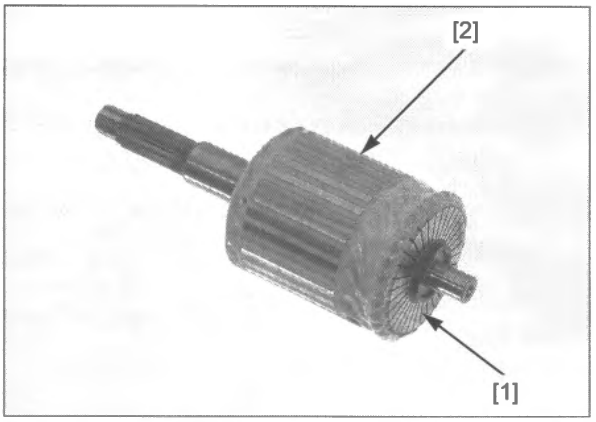
Check the commutator bars [1] for damage or abnormal wear.

Check the commutator bars of the armature [2] for discoloration.

Clean any metal debris from between commutator bars.

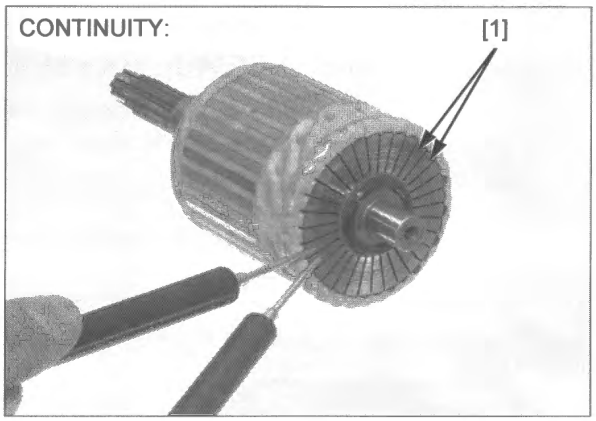
NOTE:

- Do not use emery or sand paper on the commutator.



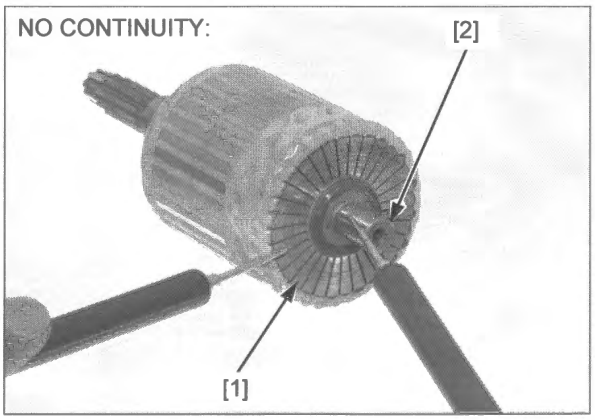
Check for continuity between pairs of commutator bars [1].

There should be continuity.



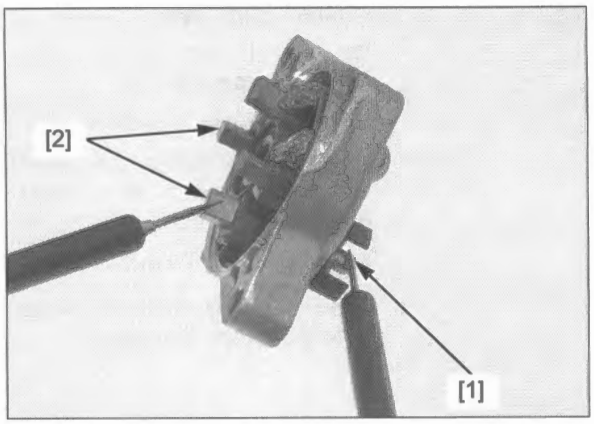
Check for continuity between each commutator bar [1] and the armature shaft [2].

There should be no continuity.



Check for continuity between the starter motor cable terminal [1] and positive brushes [2].

There should be continuity.



Check for continuity between the positive brushes [1] and the rear cover [2].

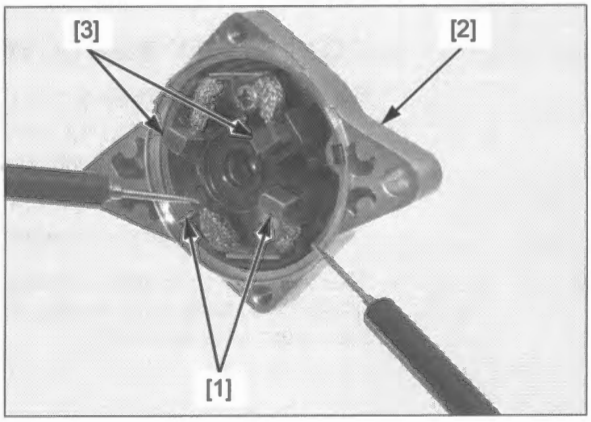
There should be no continuity.

Check for continuity between the negative brushes [3] and the rear cover.

There should be continuity.

Check for continuity between the positive and negative brushes.

There should be no continuity.



STARTER RELAY SWITCH

OPERATION INSPECTION

Remove the rear fender cover (page 2-12).

Shift the transmission into neutral.
Turn the ignition switch ON and engine stop switch "○".

Push the starter/override switch.

The relay coil is normal if the starter relay switch [1] clicks.
If you don't hear the switch "CLICK", inspect the relay switch:

- circuit inspection (page 6-9)
- continuity inspection (page 6-10)



CIRCUIT INSPECTION

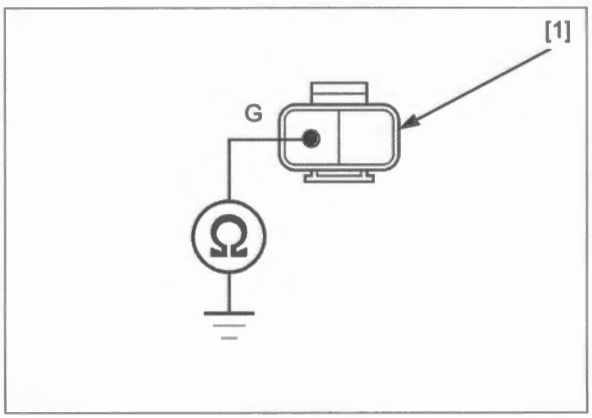
Ground Line:

Disconnect the starter relay switch 2P (Green) connector (page 6-10).

Check for continuity between the wire harness side starter relay switch 2P (Green) connector [1] terminal and ground.

Connection: Green – Ground

There should be continuity.



Power Input Line:

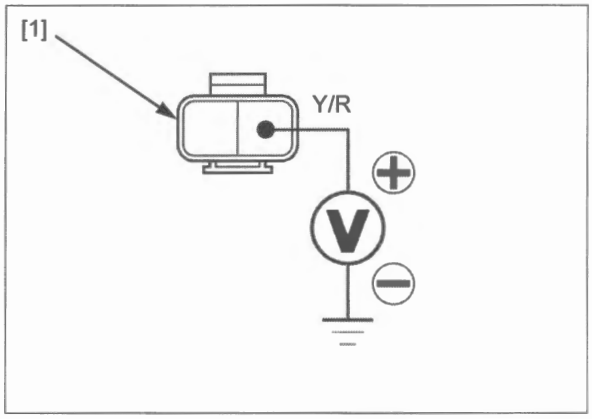
Disconnect the starter relay switch 2P (Green) connector (page 6-10).

Turn the ignition switch ON and engine stop switch "".

Measure the voltage between the wire harness side starter relay switch 2P (Green) connector [1] terminal and ground.

Connection: Yellow/red (+) – Ground (–)

There should be battery voltage only when the starter/override switch is pushed.



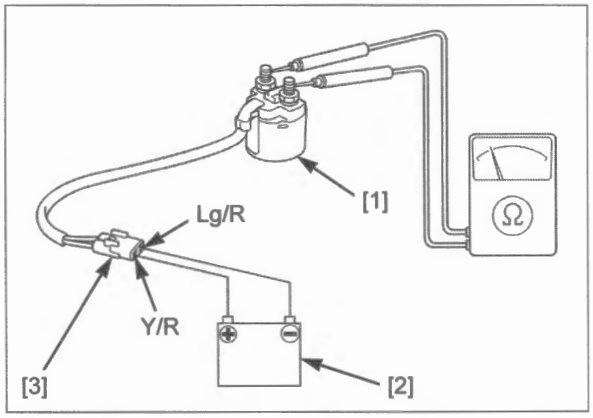
CONTINUITY INSPECTION

Remove the starter relay switch [1] (page 6-10).

Connect a fully charged 12 V battery [2] to the starter relay switch 2P (Green) connector [3] terminals.

Connection: Battery (+) terminal – Yellow/red
Battery (–) terminal – Light green/red

There should be continuity between the cable terminals while the battery is connected, and no continuity when the battery is disconnected.



REMOVAL/INSTALLATION

Disconnect the battery negative (–) cable (page 23-5).

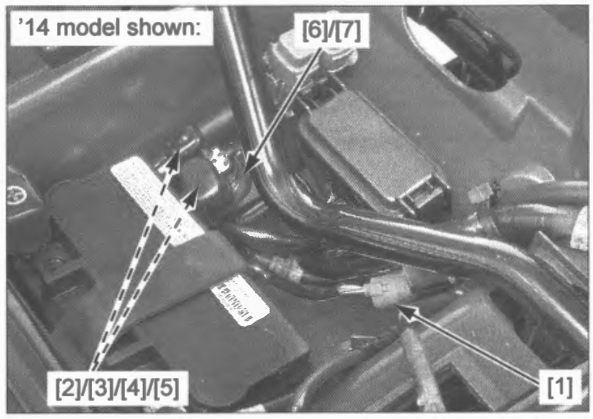
Disconnect the starter relay switch 2P (Green) connector [1].

Remove the terminal nuts [2], spring washers [3], battery positive (+) cable [4] and starter motor cable [5].

Remove the starter relay switch [6] from the rear fender with the shock rubber [7].

Remove the starter relay switch from the shock rubber.

Installation is in the reverse order of removal.



DIODE

REMOVAL/INSTALLATION

Remove the PCM/ECM (page 4-45).

Turn the ignition switch OFF and engine stop switch "⊗".

Remove the screws [1] and relay box lid [2].



Remove the diode (Y/R, G) [1].

Installation is in the reverse order of removal.

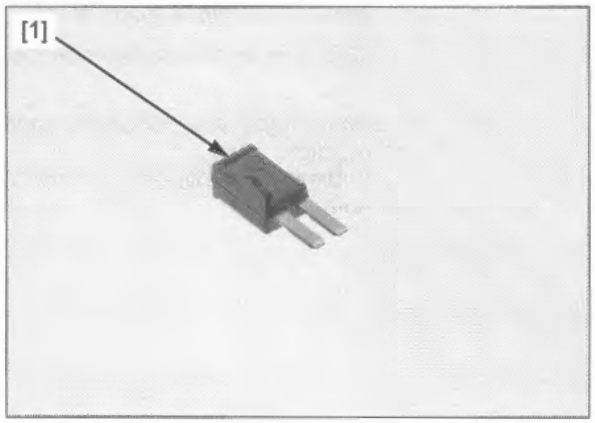


INSPECTION

Remove the diode (page 6-11).

Check for continuity between the terminals of the diode [1].

When there is continuity, a small resistance value will register.
If there is continuity in one direction, the diode is normal.



IN-GEAR START DIODE (After '14)

REMOVAL/INSTALLATION

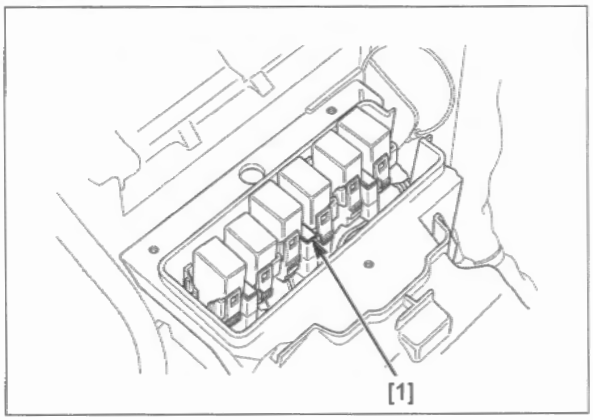
Remove the PCM/ECM (page 4-45).

Remove the screws [1] and relay box lid [2].



Remove the diode (Lg/R, Br/W) [1].

Installation is in the reverse order of removal.

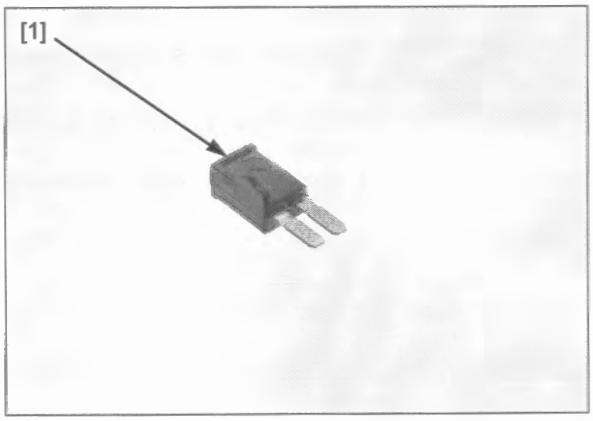


INSPECTION

Remove the diode (page 6-12).

Check for continuity between the terminals of the diode [1].

When there is continuity, a small resistance value will register.
If there is continuity in one direction, the diode is normal.



7. FUEL SYSTEM

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FUEL PUMP UNIT 7-12

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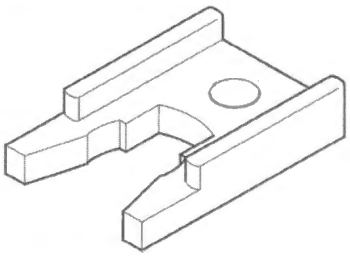
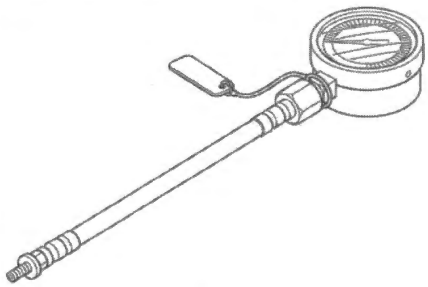
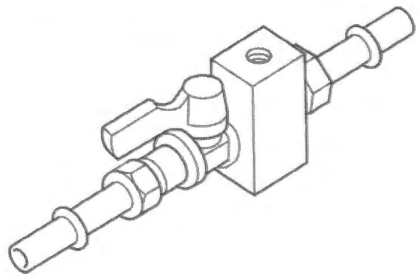
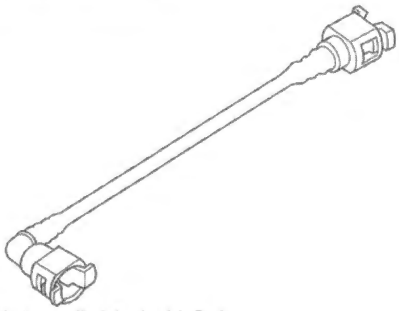
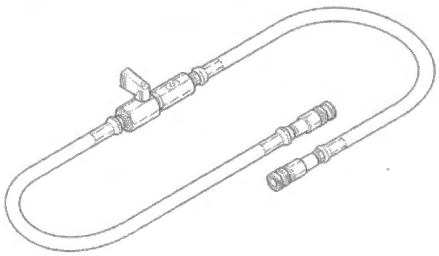
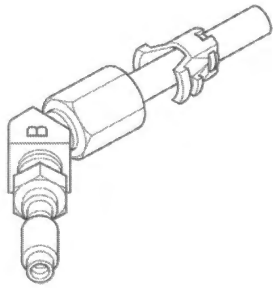
EVAP CANISTER (After '19 AC type) 7-26

SERVICE INFORMATION

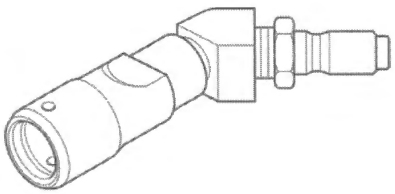
GENERAL

- This section covers service of the mechanical system of the PGM-FI system and the fuel supply system. For electrical system service of the PGM-FI system, see PGM-FI System section (page 4-2).
- Before disconnecting the fuel hose, relieve pressure from the system (page 7-6).
- Bending or twisting the control cable will impair smooth operation and could cause the cable to stick or bend, resulting in loss of vehicle control.
- Work in a well ventilated area. Smoking or allowing flames or sparks in the work area or where gasoline is stored can cause a fire or explosion.
- Do not snap the throttle valve from full open to full close after the throttle cable has been removed. It may cause incorrect idle operation.
- Seal the cylinder head intake port with tape or a clean cloth to keep dirt and debris from entering the intake port after the throttle body has been removed.
- Do not damage the throttle body. It may cause incorrect throttle valve operation.
- Prevent dirt and debris from entering the throttle bore, IACV, sensor hole and fuel hose. Clean them using compressed air.
- The throttle body is factory pre-set. Do not disassemble in a way other than shown in this manual.
- Do not loosen or tighten the white painted screws and nut of the throttle body. Loosening or tightening them can cause throttle body malfunction.
- Tighten the yellow painted screws of the throttle body to the specified torque.
- When disassembling the fuel system parts, note the location of the O-rings. Replace them with new ones upon reassembly.
- When servicing the fuel hose, be careful not to bend or kink it.

TOOLS

Fuel connector remover 070MF-HP50200  or 07AMF-001A100 (U.S.A. only)	Fuel Pressure Gauge Set 07406-0040004  or 07406-004000C or 07406-004000B (U.S.A. only)	Manifold 07ZAJ-S5A0111  Not available in U.S.A.
Hose Fuel Attachment A 07ZAJ-S5A0120  Not available in U.S.A.	Pressure manifold hose 07AMJ-HW3A100 (U.S.A. only) 	Adapter, male 07AAJ-S6MA200 (U.S.A. only) 

Adapter, female
07AAJ-S6MA400 (U.S.A. only)



FUEL LINE TROUBLESHOOTING

- For the following symptoms, always follow the steps in the troubleshooting flow chart.
  – engine stall after engine warm up
  – rough idling after engine warm up
  – engine lacks power after warm up.
- Before starting the inspection, check for pinched or clogged fuel pump breather hose and fuel hose.

1. **Fuel pump operation inspection**

   Turn the ignition switch ON and engine stop switch "○".
   You should hear the fuel pump operation sound for a few seconds.

   Is there fuel pump operation sound?

   YES – GO TO STEP 3.

   NO – GO TO STEP 2.

2. **Fuel pump Input Voltage inspection**

   Inspect the fuel pump input voltage (page 7-13).

   Is there battery voltage?

   YES – Faulty fuel pump.

   NO – • open circuit in the Brown wire and/or Green wire.
   • blown IGN fuse (20 A).
   • faulty fuel pump relay (page 7-12) and its circuits.
   • open circuit in the engine stop switch line of the PCM/ECM (page 4-46).
   • open circuit in the power/ground lines of the PCM/ECM (page 4-45).

3. **Fuel flow inspection**

   Inspect the fuel flow (page 7-12).

   Is the fuel flow as specified?

   YES – GO TO STEP 5.

   NO – GO TO STEP 4.

4. **Fuel pump filter inspection**

   Inspect the fuel pump filter for clogged (page 7-14).

   Is the fuel pump filter normal?

   YES – • Replace the fuel pump with a new one (page 7-14), and recheck.

   NO – • Replace the fuel pump filter with a new one (page 7-15), and recheck the fuel flow (page 7-12). If the fuel flow is less than specified, replace the fuel pump (page 7-14).

5. **Fuel pressure inspection**

   Inspect the fuel pressure (page 7-11).

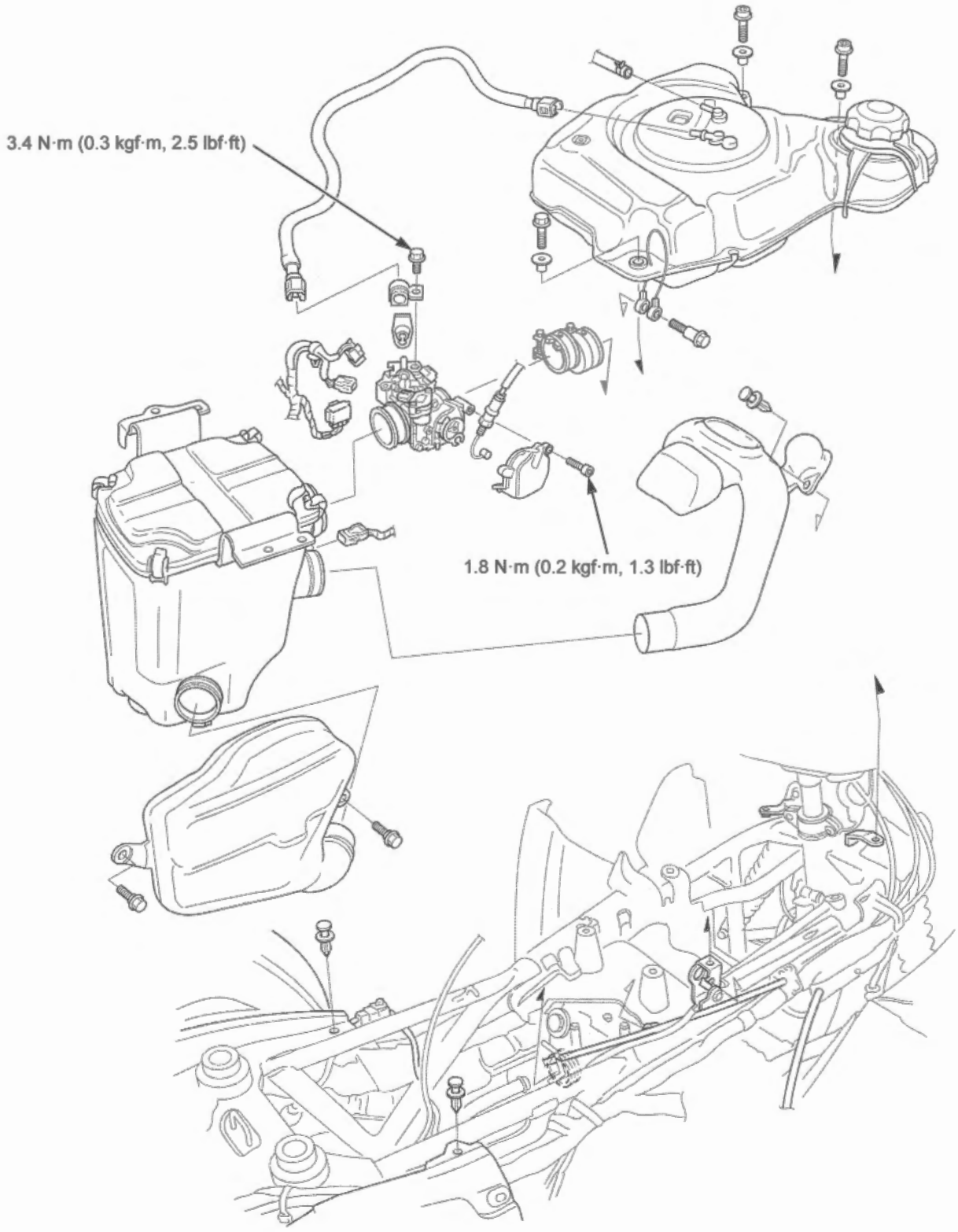
   Is the fuel pressure as specified?

   YES – • Inspect the ignition system (page 5-5).
   • Inspect the cylinder compression (page 10-6).

   NO – Replace the fuel pump with a new one (page 7-14), and recheck.

SYSTEM COMPONENTS

'14 model shown:



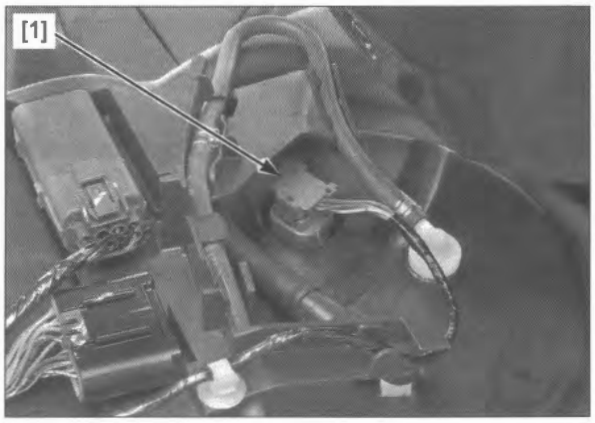
FUEL LINE INSPECTION

FUEL PRESSURE RELIEVING

NOTE:

- Before disconnecting fuel hose, relieve pressure from the system as following procedures.

1. Remove the tank cover assembly (page 2-4).
2. Turn the ignition switch OFF.
3. Disconnect the fuel pump unit 4P (Gray) connector [1].
4. Start the engine, and let it idle until the engine stalls.
5. Turn the ignition switch OFF.
6. Disconnect the battery negative (–) cable (page 23-5).



QUICK CONNECT FITTING REMOVAL

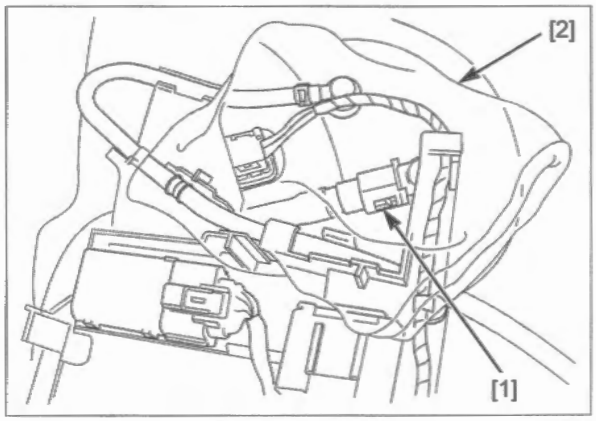
NOTE:

- Do not bend or twist the fuel hose.

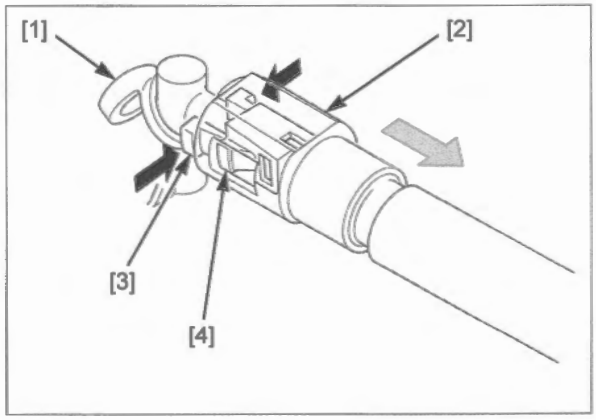
FUEL PUMP SIDE

1. Relive the fuel pressure (page 7-6).
2. Check the fuel quick connect fitting [1] for dirt, and clean if necessary.

   Place a shop towel [2] over the quick connect fitting.



3. Pull and release the connector damper [1] from the retainer.
4. Hold the connector [2] with one hand and squeeze the retainer tabs [3] with the other hand to release the locking pawls [4] from the connector and pull the connector off the fuel pipe.

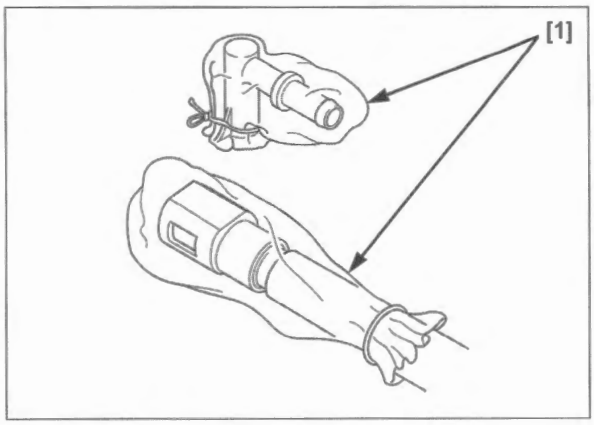


NOTE:

- Absorb the remaining fuel in the fuel hose from flowing out with a shop towel.
- Be careful not to damage the hose or other parts.
- Do not use any tools to disconnect the connector.
- If the connector does not move, keep the retainer tabs pressed down, and alternately pull and push the connector until it comes off easily.

5. Remove the retainer and connector damper from the fuel pipe.

   To prevent damage and keep foreign matter out, cover the disconnected connector and pipe end with plastic bags [1].

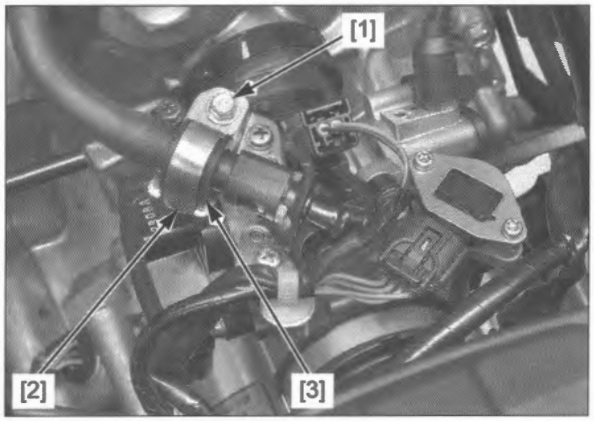


FUEL INJECTOR SIDE

1. Relive the fuel pressure (page 7-6).

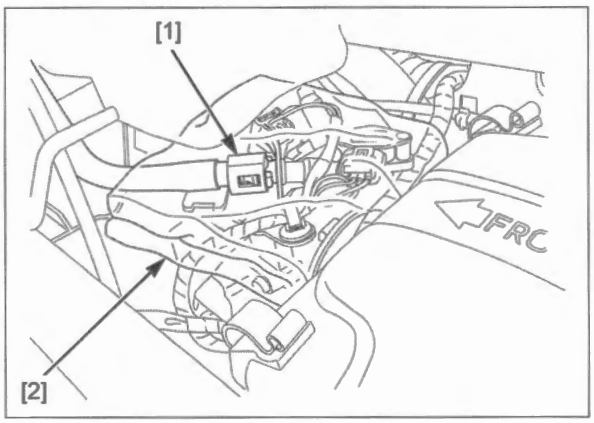
   Remove the snorkel duct (page 3-8).

   Remove the bolt [1], clamp [2] and setting rubber [3].



2. Check the fuel quick connect fitting [1] for dirt, and clean if necessary.

   Place a shop towel [2] over the quick connect fitting.



3. Pull and release the connector damper [1] from the retainer.
4. Hold the connector [2] with one hand and squeeze the retainer tabs [3] with the other hand to release the locking pawls [4] from the connector and pull the connector off the fuel pipe.

   If using the special tool:

   Pull and release the connector damper [1] from the retainer as shown.

   Set the special tool to the retainer tabs and push and release them from the locking pawls.

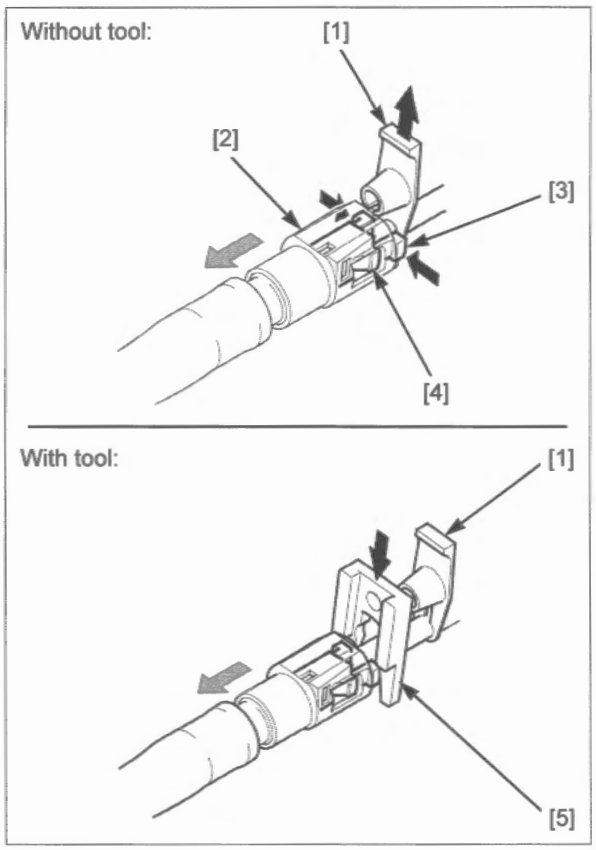
   TOOL:

   [5] Fuel connector remover **070MF-HP50200 or 07AMF-001A100 (U.S.A only)**

   Pull the connector off, then remove the retainer and connector damper from the pipe end.

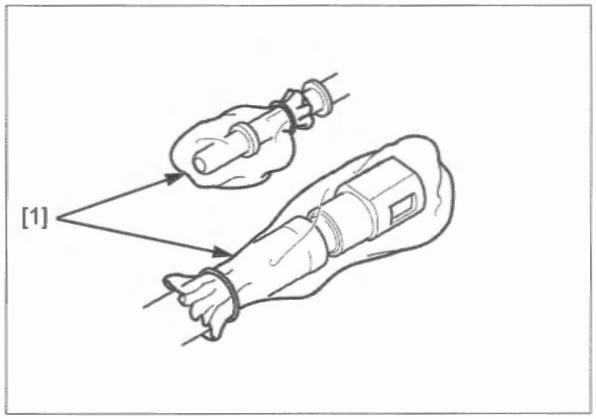
NOTE:

- Absorb the remaining fuel in the fuel hose from flowing out with a shop towel.
- Be careful not to damage the hose or other parts.
- Use the specified special tool only.
- If the connector does not move, keep the retainer tabs pressed down, and alternately pull and push the connector until it comes off easily.



5. Remove the retainer and connector damper from the fuel pipe.

   To prevent damage and keep foreign matter out, cover the disconnected connector and pipe end with plastic bags [1].



QUICK CONNECT FITTING INSTALLATION

NOTE:

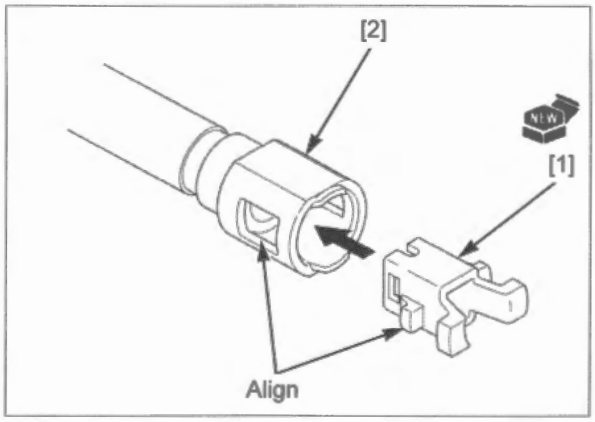
- Always replace the retainer and connector damper of the quick connect fitting when the fuel hose is disconnected.
- If any retainer needs replacing, use the same manufacturer's retainer as the ones being removed (The various manufactures feature different retainer specifications).
- Do not bend or twist fuel hose.

FUEL PUMP SIDE

1. Insert a new retainer [1] into the connector [2].

NOTE:

- Align the retainer locking pawls with the connector grooves.

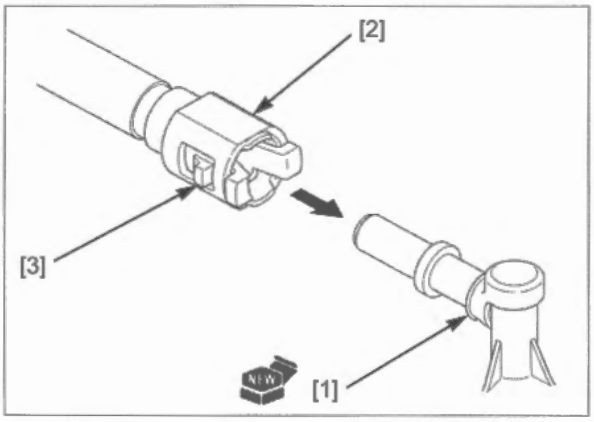


2. Set a new connector damper [1] to the pipe end as shown.

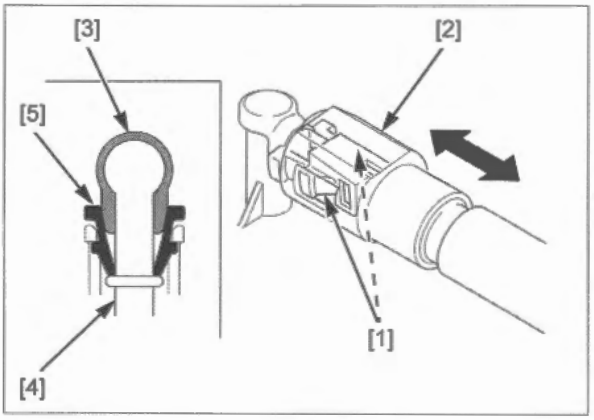
   Install the connector on the fuel pipe straight. Then press the quick connect fitting [2] onto the pipe until both locking pawls [3] lock with a "CLICK".

NOTE:

- If it is hard to connect, put a small amount of engine oil on the pipe end.



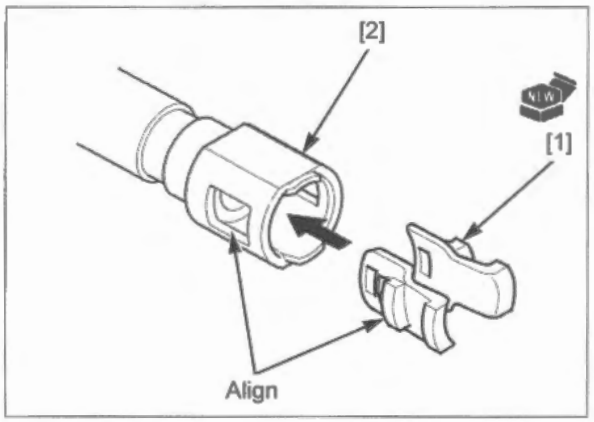
3. Make sure the connection is secure and that the locking pawls [1] are firmly locked into place; check visually and by pulling the connector [2].
4. Make sure the connector damper [3] is positioned correctly (between the pipe [4] and retainer tabs [5]).
5. Increase the fuel pressure and check that there is no leakage in fuel supply system (page 7-11).



FUEL INJECTOR SIDE

1. Insert a new retainer [1] into the connector [2].

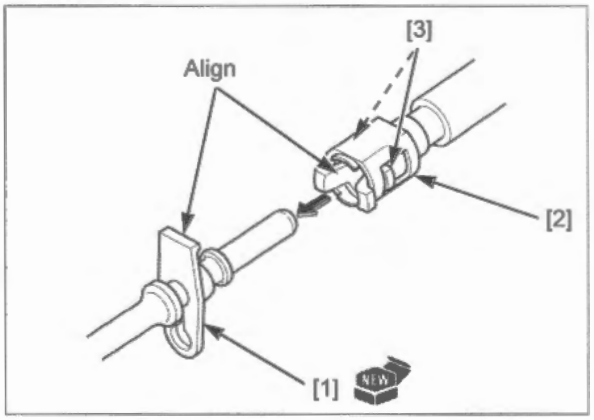
NOTE:
- Align the retainer locking pawls with the connector grooves.



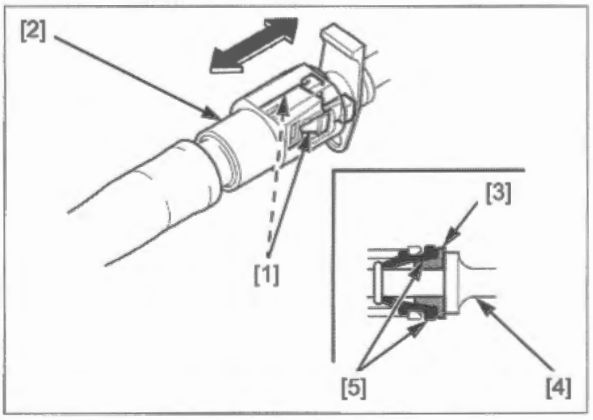
2. Set a new connector damper [1] to the fuel injector joint as shown.

   Install the connector on the fuel pipe.
   Then press the quick connect fitting [2] onto the pipe until both locking pawls [3] lock with a "CLICK".

NOTE:
- Align the retainer groove with the connector damper tabs.
- If it is hard to connect, put a small amount of engine oil on the fuel injector joint.



3. Make sure the connection is secure and that the locking pawls [1] are firmly locked into place; check visually and by pulling the connector [2].
4. Make sure the connector damper [3] is positioned correctly (between the pipe [4] and retainer tabs [5]).

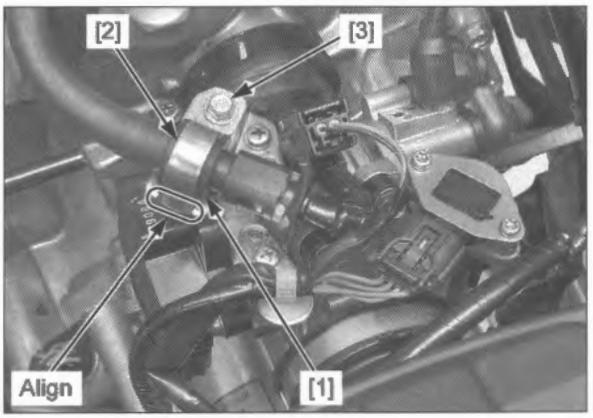


5. Install the setting rubber [1] and clamp [2].

NOTE:
- Install the clamp by aligning its tab with the groove of the fuel hose clamp stay.

  Install and tighten the bolt [3] securely.

6. Install the snorkel duct (page 3-8).
7. Increase the fuel pressure and check that there is no leakage in fuel supply system (page 7-11).



FUEL PRESSURE INCREASING

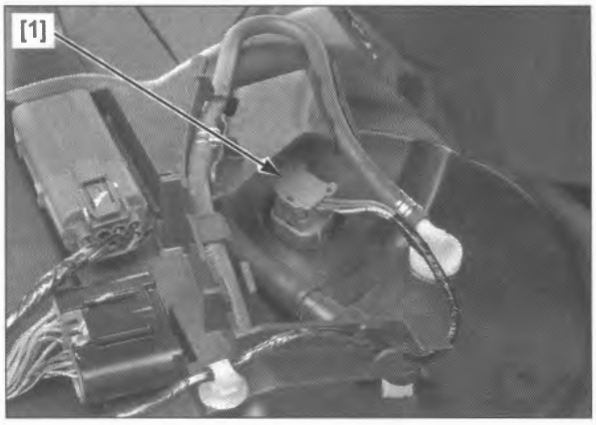
1. Connect the fuel pump unit 4P (Gray) connector [1].
2. Connect the battery negative (–) cable (page 23-5).
3. Turn the ignition switch ON and engine stop switch "○".

NOTE:
- Do not start the engine.

4. The fuel pump will run for about 2 seconds, and fuel pressure will rise.

   Turn the ignition switch OFF.

   Repeat this procedure 2 or 3 times, and check that there is no leakage in the fuel supply system.
5. Install the tank cover assembly (page 2-4).



FUEL PRESSURE INSPECTION

Relieve the fuel pressure and disconnect the quick connect fitting from the fuel pump (page 7-6).

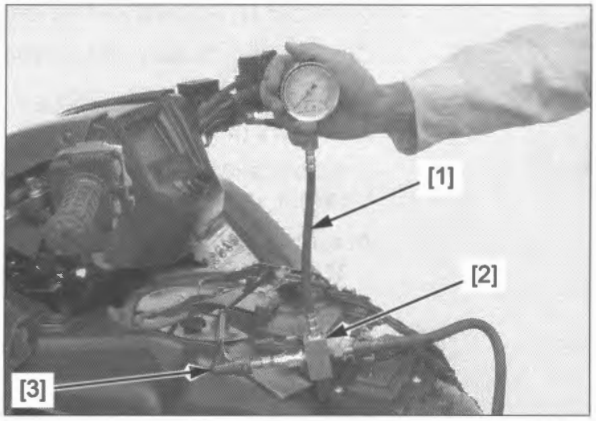
Attach the special tools between the fuel pump and fuel hose.

TOOLS:

[1] Fuel Pressure Gauge Set	**07406-0040004**
[2] Manifold	**07ZAJ-S5A0111**
[3] Hose Fuel Attachment A	**07ZAJ-S5A0120**

U.S.A. TOOLS:

Fuel pressure gauge, 100 psi	**07406-004000C or 07406-004000B**
Pressure manifold hose	**07AMJ-HW3A100**
Adapter, male	**07AAJ-S6MA200**
Adapter, female	**07AAJ-S6MA400**



Connect the fuel pump unit 4P (Gray) connector.
Temporarily connect the battery negative (–) cable (page 23-5).
Start the engine and let it idle.
Read the fuel pressure.

Standard: 331 – 367 kPa (3.4 – 3.7 kgf/cm², 48 – 53 psi)

If the fuel pressure is higher than specified pressure, replace the fuel pressure regulator (page 7-14).

If the fuel pressure is lower than specified, inspect the following:

– pinched or clogged fuel hose or fuel pump breather hose
– fuel flow (page 7-12)
– clogged fuel pump filter (page 7-15)
– fuel pump (page 7-13)

After inspection, relieve the fuel pressure (page 7-6).

Wrap a shop towel around the attachment to soak up any spilled fuel.

Remove the special tools from the fuel pump and fuel hose.

Connect the quick connect fitting to the fuel pump (page 7-10).

FUEL FLOW INSPECTION

Relieve the fuel pressure and disconnect the quick connect fitting from the fuel pump (page 7-6).

Connect the special tool to the fuel pump.

TOOL:
[1] Hose Fuel Attachment A 07ZAJ-S5A0120

U.S.A. TOOLS:
Pressure manifold hose 07AMJ-HW3A100
Adapter, female 07AAJ-S6MA400
Fuel pressure gauge, 100 psi 07406-004000B
Note: The fuel pressure gauge must be installed for these tests.

Place the end of the hose into an approved gasoline container.

Remove the fuel pump relay (page 7-12).

Connect the wire harness side fuel pump relay connector [2] terminals with a jumper wire [3].

Connection: Brown – Black/red

Temporarily connect the battery negative (–) cable to the battery (page 23-5).

Turn the ignition switch ON and engine stop switch "○". Measure the amount of fuel flow.

Amount of fuel flow:
356 cm³ (12.0 US oz, 12.5 Imp oz) minimum/ 10 seconds at 12 V

If the fuel flow is less than specified, inspect the following:

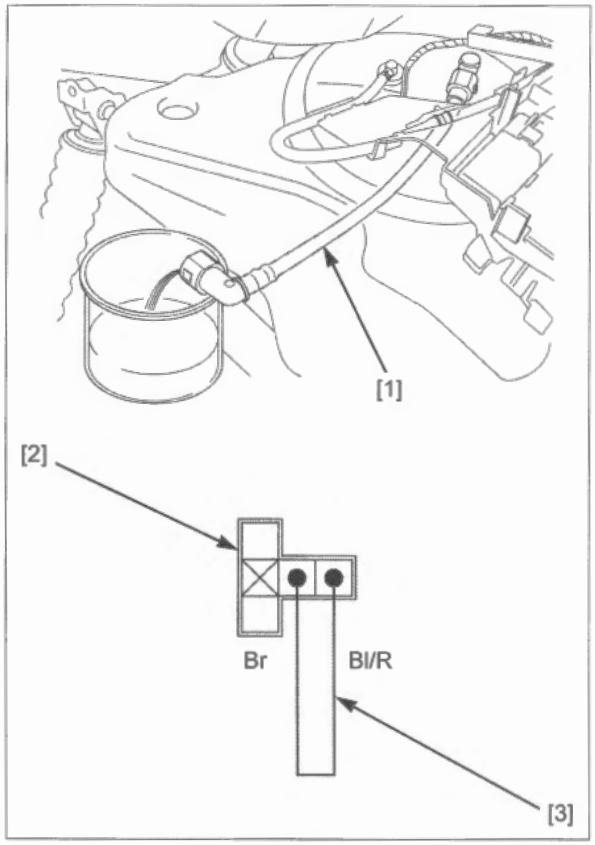
- pinched or clogged fuel hose or fuel pump breather hose
- clogged fuel pump filter (page 7-15)
- fuel pump (page 7-13)

Turn the ignition switch OFF.

Wrap a shop towel around the attachment to soak up any spilled fuel.

Remove the special tool from the fuel pump.

Connect the quick connect fitting to the fuel pump (page 7-9).



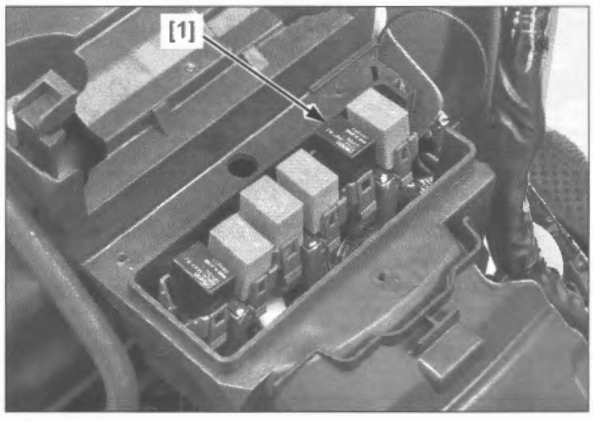
FUEL PUMP UNIT

FUEL PUMP RELAY INSPECTION

Remove the relay box lid (page 6-11).

Turn the ignition switch OFF.

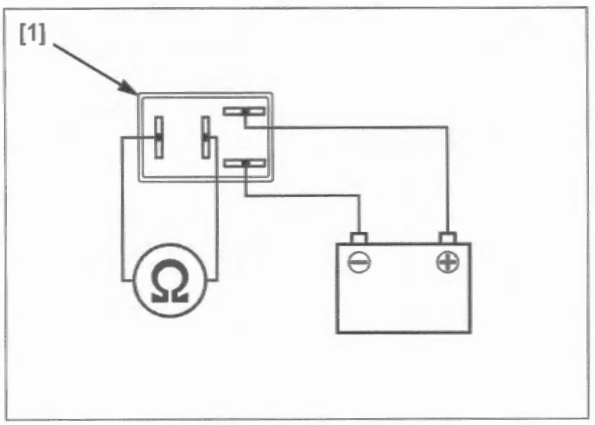
Remove the fuel pump relay [1].



Connect an ohmmeter to the terminals of the fuel pump relay [1].

Connect a 12 V battery to the fuel pump relay terminals as shown.

There should be continuity only when the 12 V battery is connected.
If there is no continuity when the 12 V battery is connected, replace the fuel pump relay.



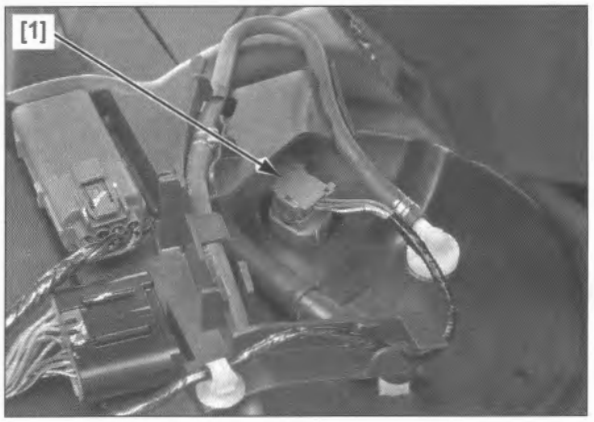
INSPECTION

Remove the tank cover assembly (page 2-4).

Turn the ignition switch ON and engine stop switch "○", and confirm that the fuel pump operates for a few seconds.
If the fuel pump does not operate, inspect as follows:

Turn the ignition switch OFF.

Disconnect the fuel pump unit 4P (Gray) connector [1].



Turn the ignition switch ON and engine stop switch "○", measure the voltage between the wire harness side fuel pump unit 4P (Gray) connector [1] terminals.

Connection: Brown (+) – Green (–)

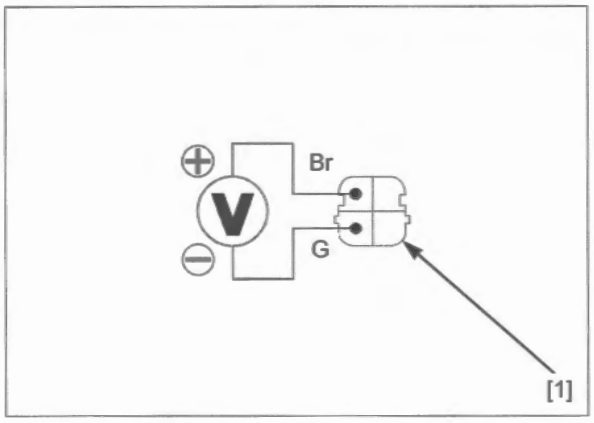
There should be battery voltage for a few seconds after the ignition switch turned ON and engine stop switch "○".

If there is battery voltage, check the following:

- open circuit in the fuel pump wire
- fuel pump for damage

If there is no voltage, check the following:

- open circuit in the Brown and/or Green wire
- IGN fuse (20 A)
- fuel pump relay (page 7-12) and its circuits
- engine stop switch line of the PCM/ECM (page 4-46)
- power/ground lines of the PCM/ECM (page 4-45)

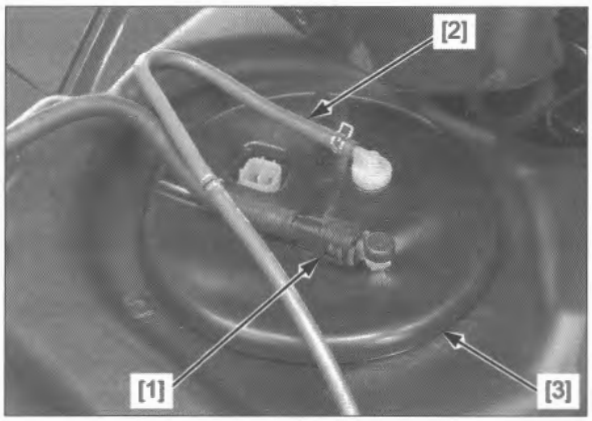


REMOVAL

Remove the ECM stay (page 3-8).
Relieve the fuel pressure and disconnect the quick connect fitting [1] from the fuel pump (page 7-6).

Disconnect the fuel pump breather hose [2].

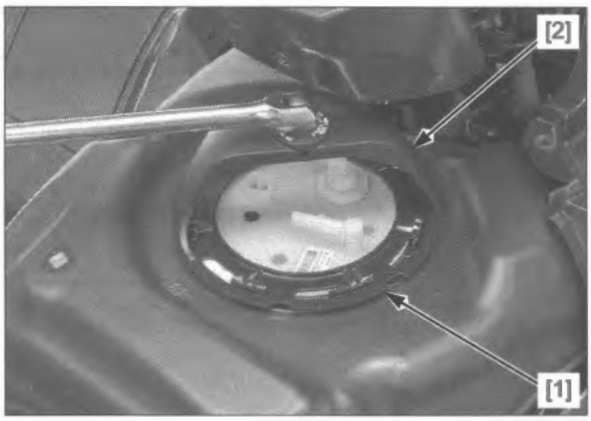
'14 – '16 models only: Remove the fuel pump cover [3].



Remove the locking ring [1] by rotating it counter-clockwise using the special tool.

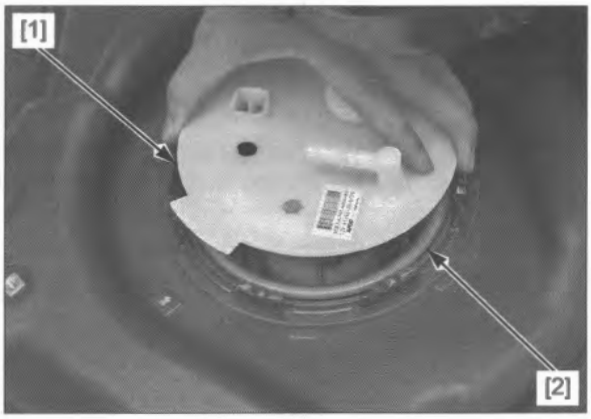
TOOL:

[2] Fuel Tank Lock Ring Wrench OTC6599 or Commercially available in U.S.A.



Remove the fuel pump unit [1] and O-ring [2].

- Be careful not to damage the fuel level sensor.



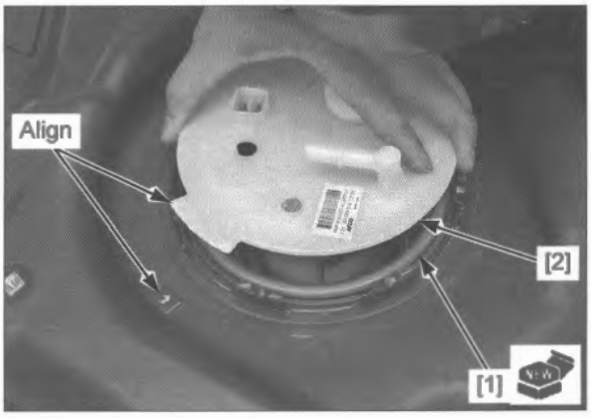
INSTALLATION

Install a new O-ring [1].

- Clean the O-ring seating area of the fuel tank, and be sure that no foreign materials are allowed.
- Always replace the O-ring with a new one.

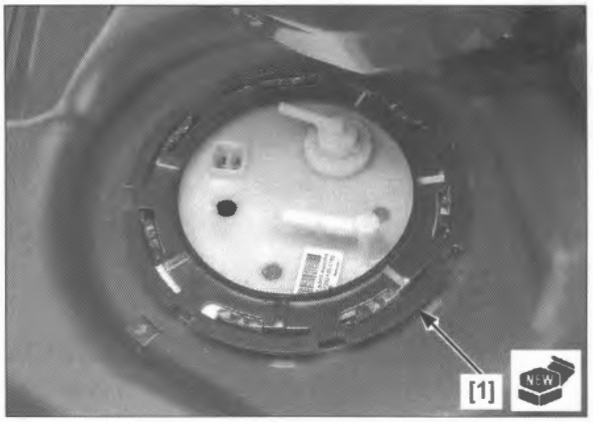
Install the fuel pump unit [2] aligning its tab with the arrow mark.

- Be careful not to damage the fuel level sensor.



Install a new locking ring [1].

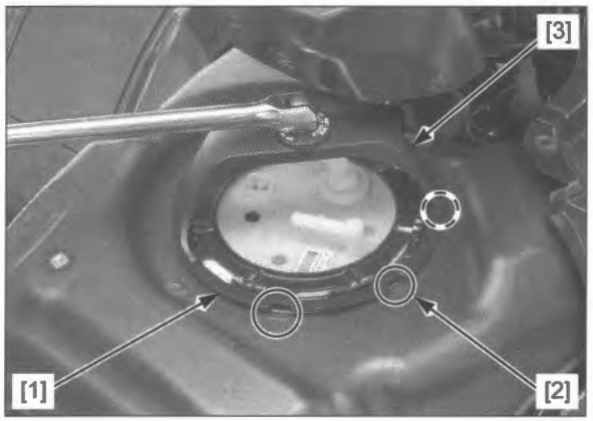
- Always replace the locking ring with a new one.



Turn the locking ring [1] clockwise using the special tool until the marks [2] of the fuel tank align with the grooves of the locking ring.

TOOL:

[3] Fuel Tank Lock Ring Wrench OTC6599 or Commercially available in U.S.A.



Connect the quick connect fitting to the fuel pump (page 7-9).

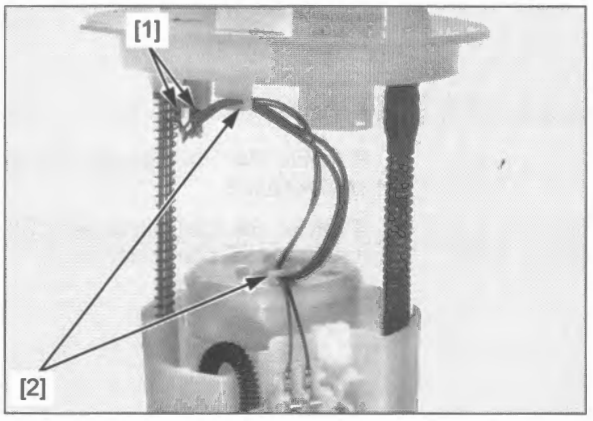
Install the removed parts in the reverse order of removal.

DISASSEMBLY/ASSEMBLY

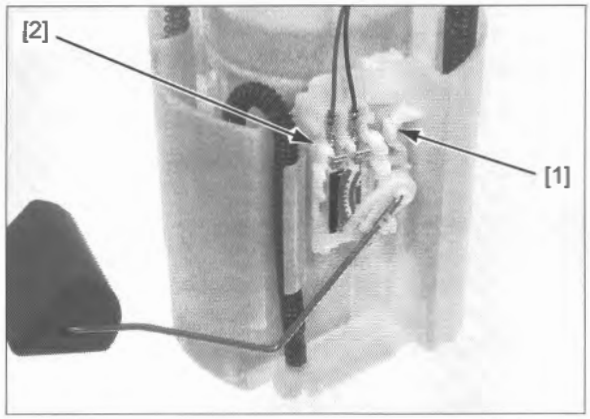
NOTE:

- Clean the inside of the reservoir, fuel pump and filter with clean gasoline. Never use commercially available carburetor cleaners.
- Always replace all O-rings with new ones when the fuel pump has been disassembled.
- Be careful not to damage the fuel pump and fuel level sensor wires.

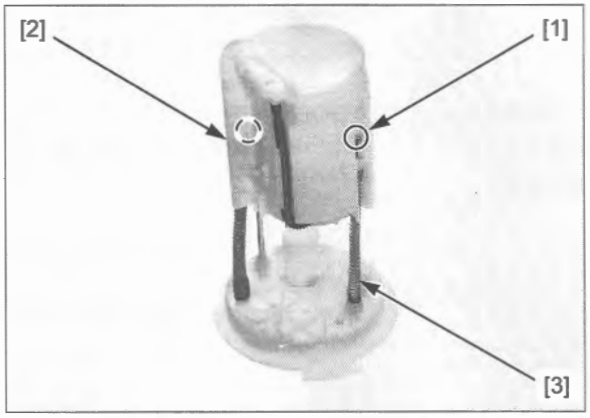
Disconnect the connectors [1] and release the wires from the guides [2].



Unhook the tab [1] and remove the fuel level sensor [2] upward.

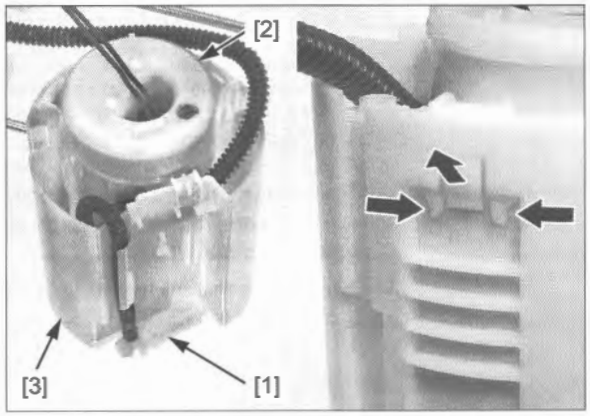


Remove the E-rings [1], reservoir [2] and spring [3].



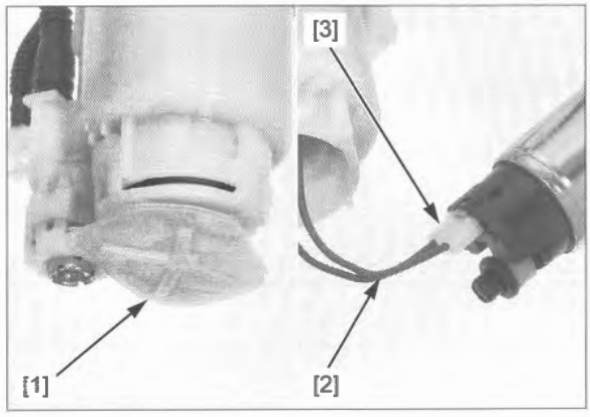
Remove the return jet [1] and strainer case [2] from the reservoir [3].

- Unhook the hooks as shown.



Remove the fuel pump/filter assembly [1] from the strainer case.

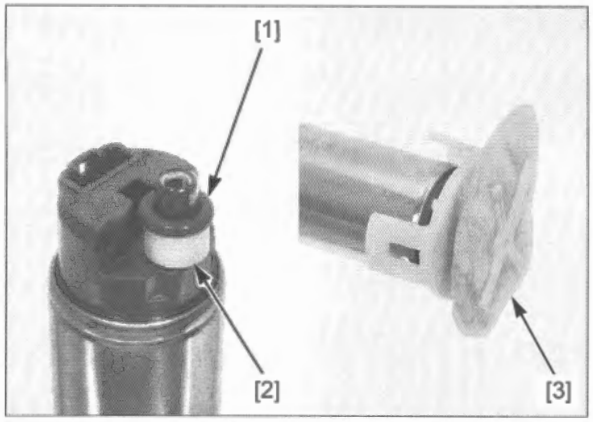
Remove the fuel pump wire [2] by disconnecting the fuel pump 2P connector [3].



Remove the O-ring [1] and spacer [2].

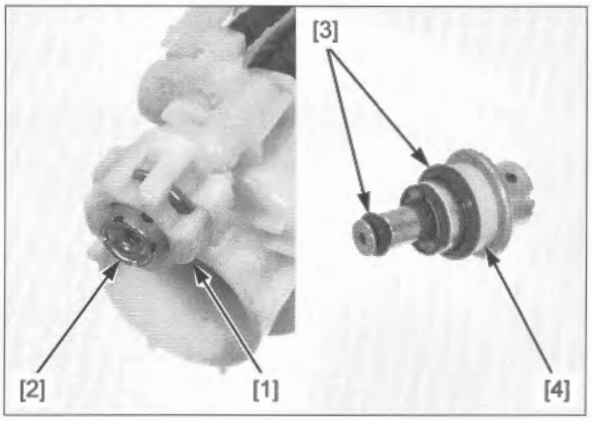
Check the filter [3] for clogs or damage.

If the filter is clogged or damaged, replace the fuel pump assembly.

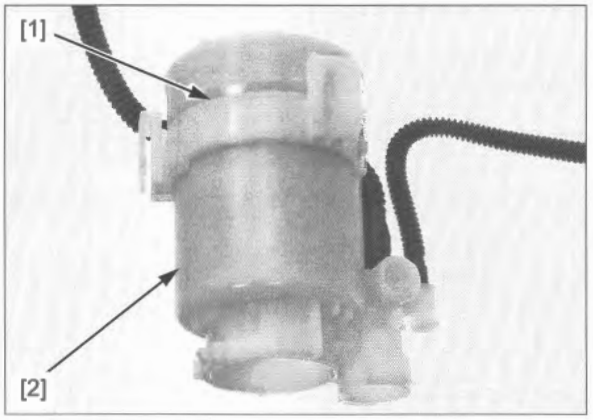


Remove the bracket [1] and pressure regulator [2].

Remove the O-rings [3] and back-up ring [4] from the pressure regulator.

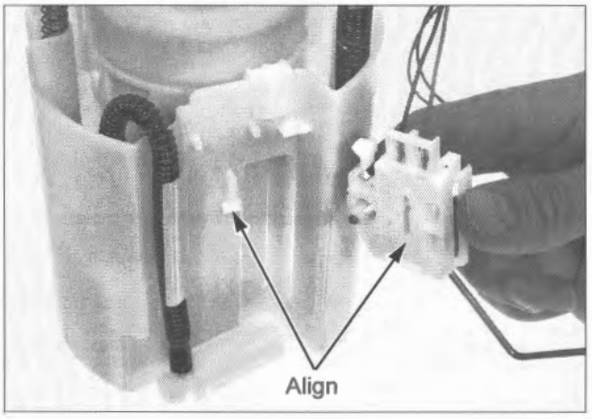


Remove the bracket [1] from the strainer case [2].



Assembly is in the reverse order of disassembly.

- Install the fuel level sensor aligning its groove with the strainer case tab.



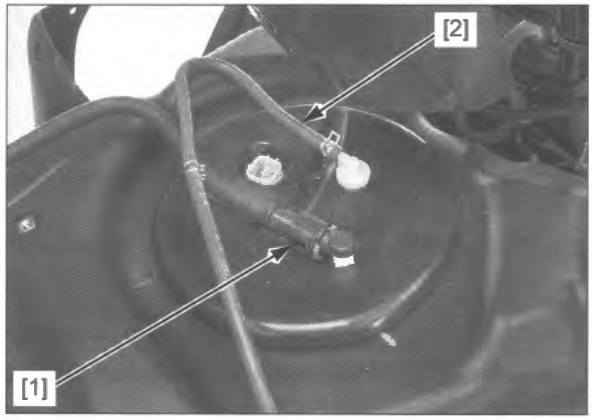
FUEL TANK

REMOVAL/INSTALLATION

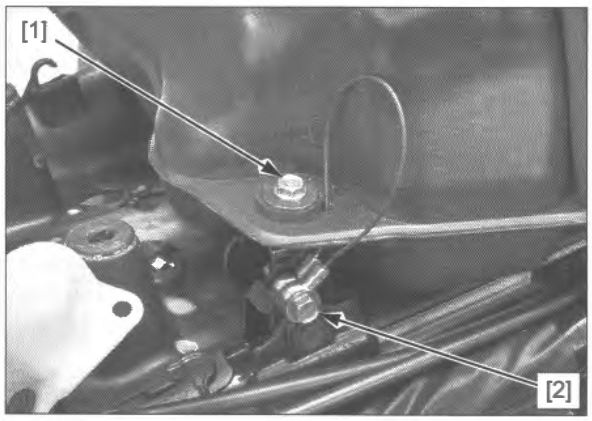
Remove the ECM stay (page 3-8).
Remove the front fender/carrier (page 2-8).

Relieve the fuel pressure and disconnect the quick connect fitting [1] from the fuel pump (page 7-6).

Disconnect the fuel pump breather hose [2].



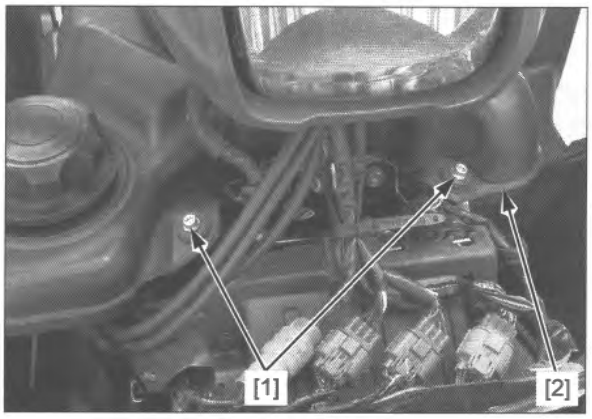
Remove the bolt [1] and setting bolt [2].



Remove the torx bolts (T30) [1] and fuel tank [2].

Installation is in the reverse order of removal.

- Connect the quick connect fitting to the fuel pump (page 7-9).



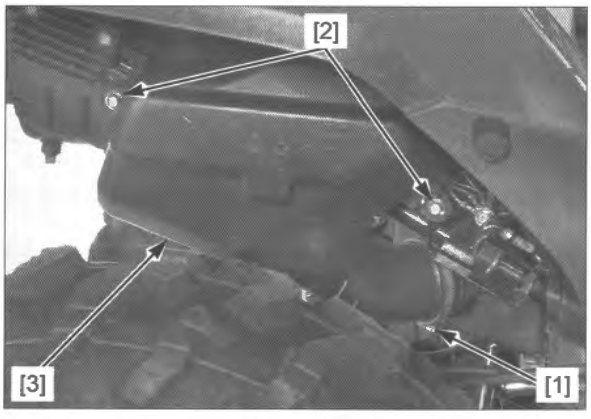
AIR CLEANER HOUSING

REMOVAL/INSTALLATION

Remove the snorkel duct (page 3-8).

Loosen the connecting tube band screw [1].

Remove the bolts [2] and air cleaner sub chamber [3].



Disconnect the following:

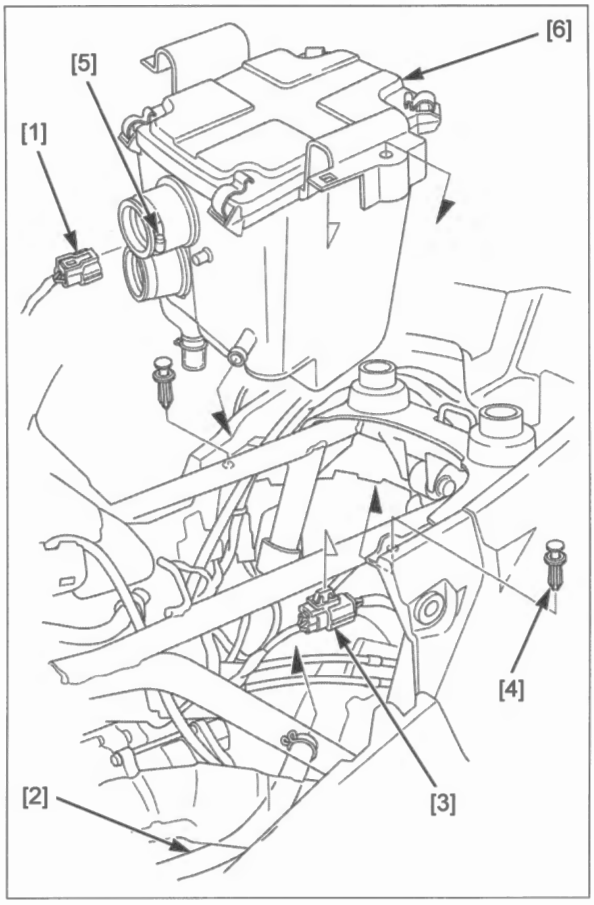
- IAT sensor 2P (Black) connector [1]
- crankcase breather hose [2]

Remove the following:

- O_2 sensor 4P (Black) connector [3]
- trim clips [4]

Loosen the connecting tube band screw [5], position the air cleaner tabs to allow clearance from the frame and rear fender tabs, and remove the air cleaner housing [6].

Installation is in the reverse order of removal.



THROTTLE BODY

NOTE:

- If the sensor unit is removed from the throttle body, the TP sensor reset procedure must be performed after installing the throttle body (page 4-42).

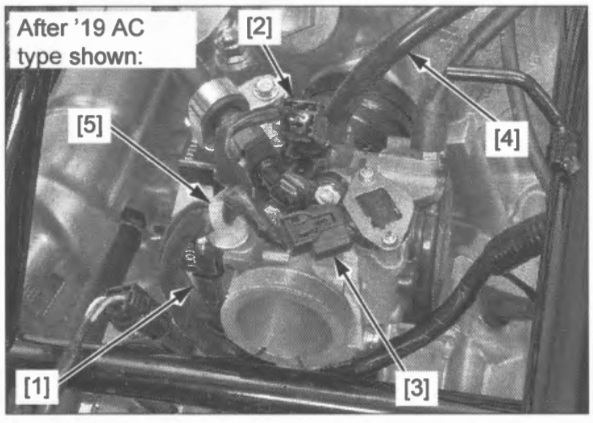
REMOVAL

Remove the air cleaner housing (page 7-18).
Relieve the fuel pressure and disconnect the quick connect fitting from the fuel injector (page 7-7).

Disconnect the following:

- IACV 4P (Black) connector [1]
- fuel injector 2P connector [2]
  - Gray ('14 – '19)
  - Black (After '19)
- sensor unit 5P (Black) connector [3]
- EVAP purge control solenoid valve-to-throttle body hose [4] (After '19 AC type)

Remove the harness clip [5].

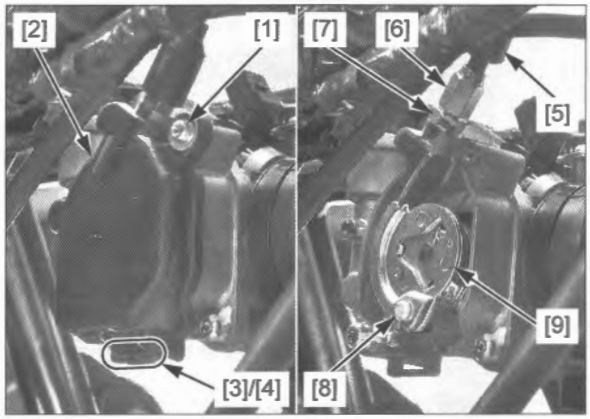


Remove the screw [1].

Remove the throttle drum cover [2] while releasing its tab [3] from the throttle body slot [4].

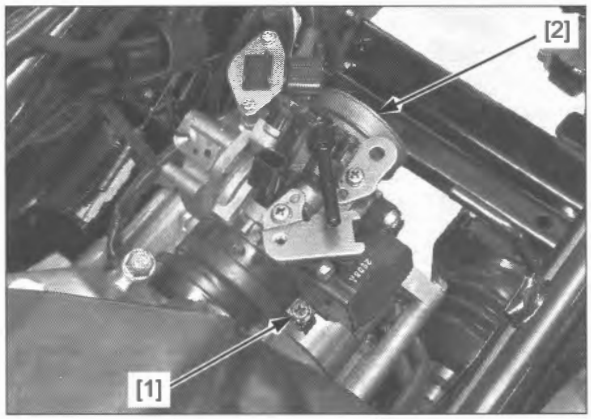
Slide the rubber boot [5] off the adjuster [6].

Loosen the throttle cable adjuster lock nut [7], remove the adjuster from the throttle body and disconnect the cable end [8] from the throttle drum [9].



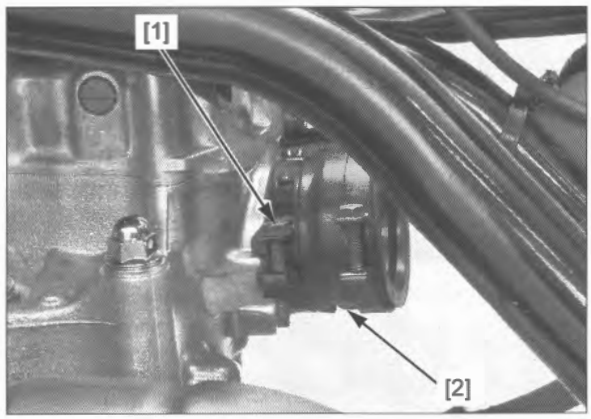
Loosen the throttle body side insulator band screw [1].

Remove the throttle body [2] from the insulator.



Loosen the cylinder head side insulator band screw [1].

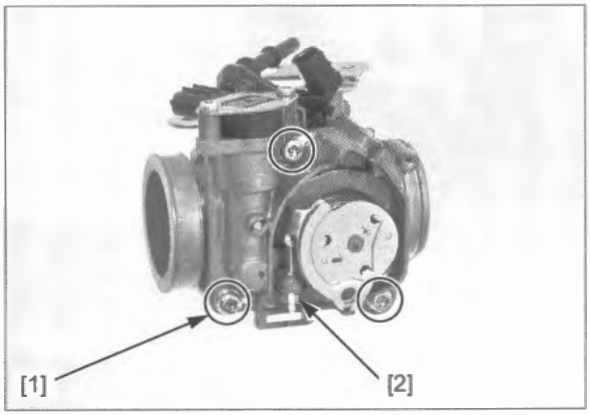
Remove the insulator [2] from the cylinder head.



DISASSEMBLY/ASSEMBLY

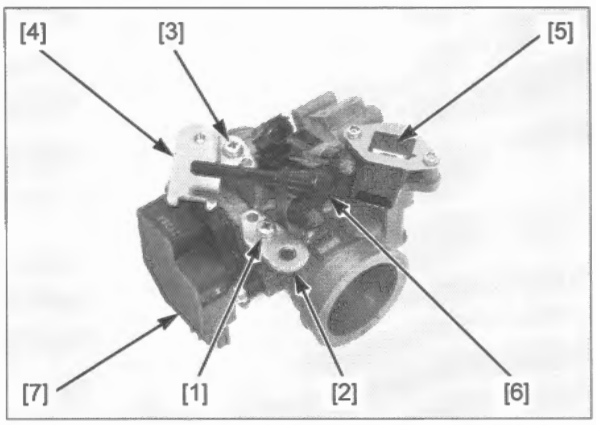
NOTICE

- *The throttle body is factory pre-set. Do not disassemble in a way other than shown in this manual.*
- *Do not snap the throttle valve from full open to full close after the throttle cable has been removed. It may cause incorrect idle operation.*
- *Do not damage the throttle body. It may cause incorrect throttle valve operation.*
- *Do not loosen or tighten the white painted screws [1] and nut [2] of the throttle body. Loosening or tightening them can cause throttle valve and idle control failure.*
- *Always clean the throttle body before disassembly to prevent dirt and debris from entering the passages.*
- *Do not remove the sensor unit unless it is replaced.*



Remove the following:

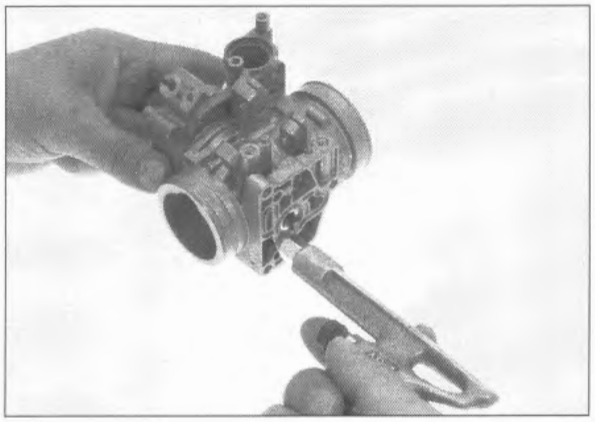
- screw [1] and wire harness clip stay [2]
- screw [3] and fuel hose clamp stay [4]
- IACV [5] (page 7-23)
- fuel injector [6] (page 7-24)
- sensor unit [7] (page 4-40)



Cleaning the air passages and sensor hole with a piece of wire will damage the throttle body.

Clean the air passage of the throttle body using compressed air.
Check the air passage for clogs.

- Do not use high pressure air or bring the nozzle too close to the throttle body.



Assembly is in the reverse order of disassembly.

- Install the harness clip stay and fuel hose clamp stay by aligning each stay hole with the pin of the throttle body.

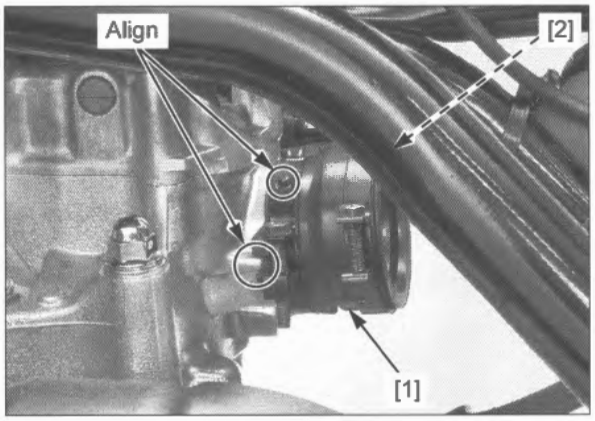
TORQUE:
Harness clip stay screw:
3.4 N·m (0.3 kgf·m, 2.5 lbf·ft)
Fuel hose clamp stay screw:
3.4 N·m (0.3 kgf·m, 2.5 lbf·ft)

INSTALLATION

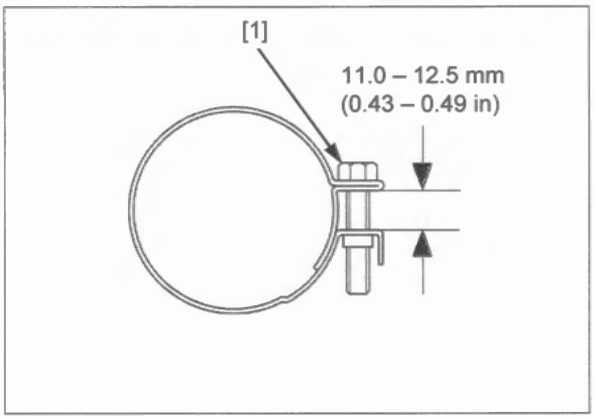
Face the "HR4" mark [2] toward the throttle body.

Install the insulator [1] onto the cylinder head by aligning the groove with the lug.

Align the cylinder head side insulator band hole with the insulator boss.

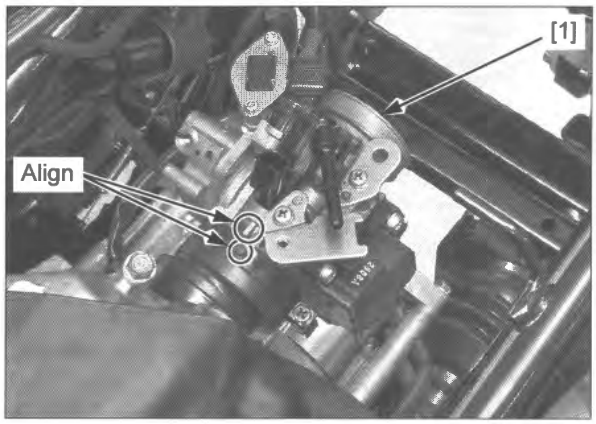


Tighten the cylinder head side insulator band screw [1] so that the distance between the band tabs is as shown.

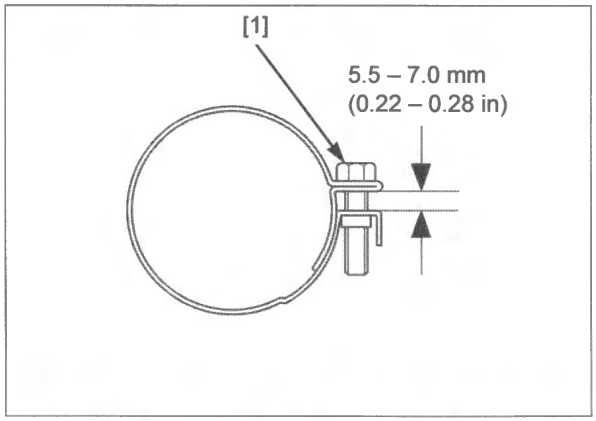


Install the throttle body [1] into the insulator by aligning the lug with the groove.

Align the throttle body side insulator band hole with the insulator boss.



Tighten the throttle body side insulator band screw [1] so that the distance between the band tabs is as shown.



Connect the throttle cable end [1] to the throttle drum [2].

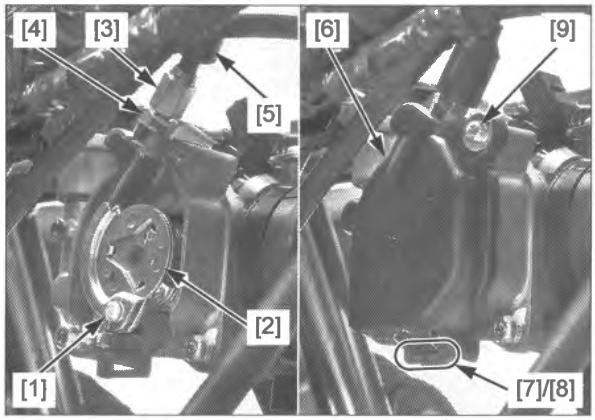
Tighten the lock nut and install the adjuster rubber boot [5] after adjusting the throttle lever freeplay.

Install the throttle cable adjuster [3] to the throttle body and temporarily tighten the lock nut [4].

Install the throttle drum cover [6] by aligning the locating tab [7] with the slot [8] in the throttle body.

Install and tighten the screw [9] to the specified torque.

TORQUE: 1.8 N·m (0.2 kgf·m, 1.3 lbf·ft)

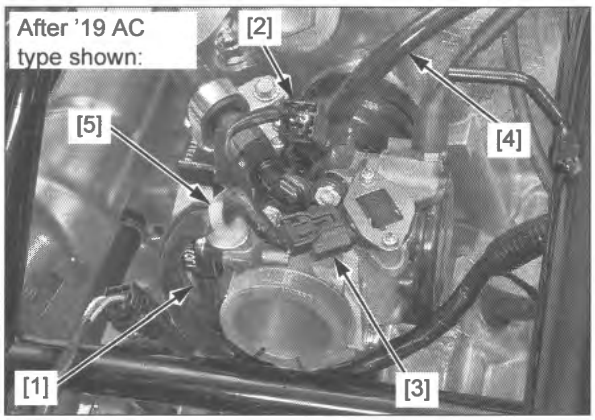


Connect the following:

- IACV 4P (Black) connector [1]
- fuel injector 2P connector [2]
  - Gray ('14 – '19)
  - Black (After '19)
- sensor unit 5P (Black) connector [3]
- EVAP purge control solenoid valve-to-throttle body hose [4] (After '19 AC type)

Install the harness clip [5]

Install the air cleaner housing (page 7-18).
Adjust the throttle lever freeplay (page 3-4).
Connect the quick connect fitting to the fuel injector (page 7-10).



IACV

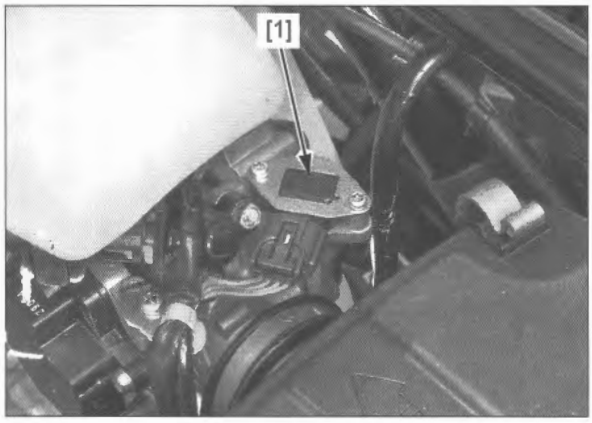
INSPECTION

- The IACV is installed on the throttle body and is operated by the step motor. When the ignition switch is turned ON, the IACV operates for a few seconds.

Remove the tank cover assembly (page 2-4).

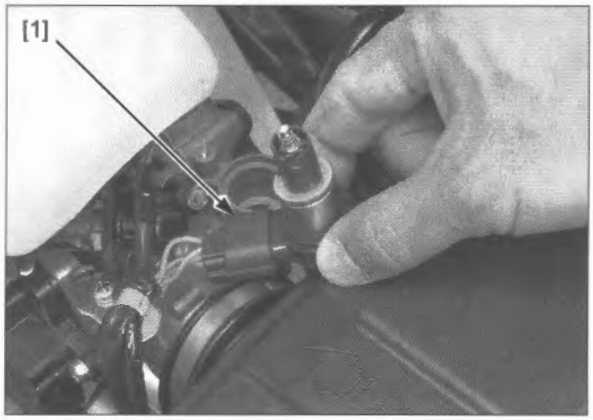
Turn the ignition switch ON, check the IACV [1].

If the step motor operating (beep) sound is heard, the IACV is normal.



The IACV operation can be checked visually as follows:

1. Remove the IACV (page 7-23).
2. Connect the IACV 4P (Black) connector [1].
3. Turn the ignition switch ON, check the IACV operation.



REMOVAL/INSTALLATION

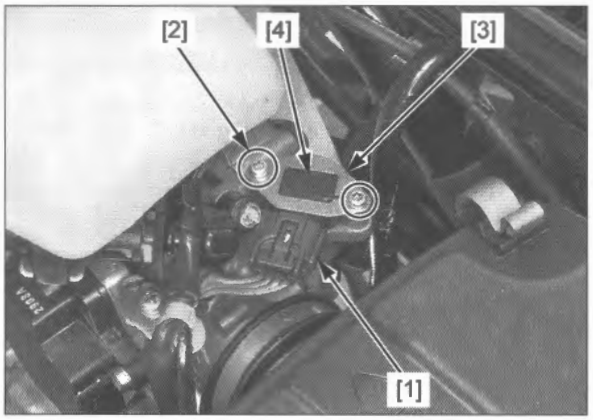
Remove the tank cover assembly (page 2-4).

Clean the throttle body to prevent dirt and debris from entering the IACV passage.

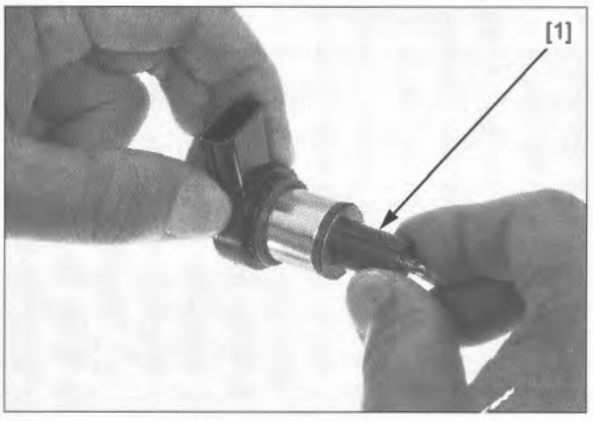
Turn the ignition switch OFF.

Disconnect the IACV 4P (Black) connector [1].

Remove the torx screws (T20) [2], retainer plate [3] and IACV [4].

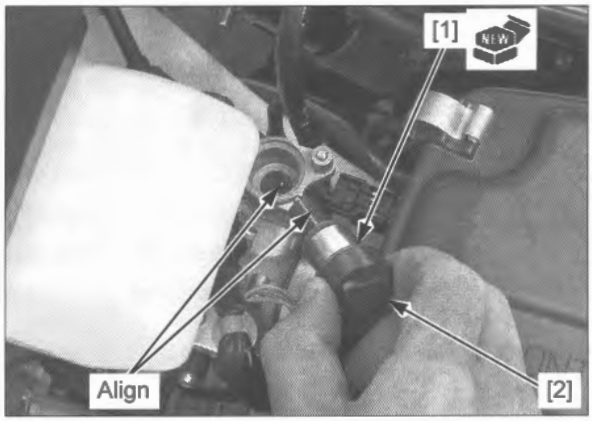


Before installing the IACV, turn the slide valve [1] clockwise until lightly seated on IACV.



Install a new O-ring [1] onto the IACV [2].

Install the IACV into the throttle body by aligning the valve slit with the guide pin in the throttle body.



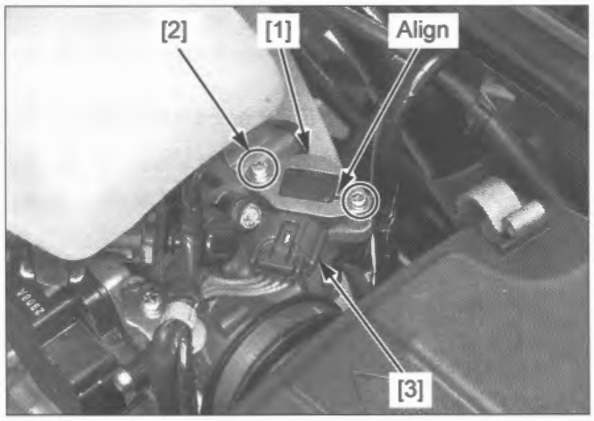
Install the retainer plate [1] by aligning the groove with the valve boss.

Install and tighten the two torx screws (T20) [2] to the specified torque.

TORQUE: 2.1 N·m (0.2 kgf·m, 1.5 lbf·ft)

Connect the IACV 4P (Black) connector [3].

Install the tank cover assembly (page 2-4).



FUEL INJECTOR

REMOVAL/INSTALLATION

Clean around the fuel injector base with compressed air and be sure that no debris is allowed to enter the combustion chamber.

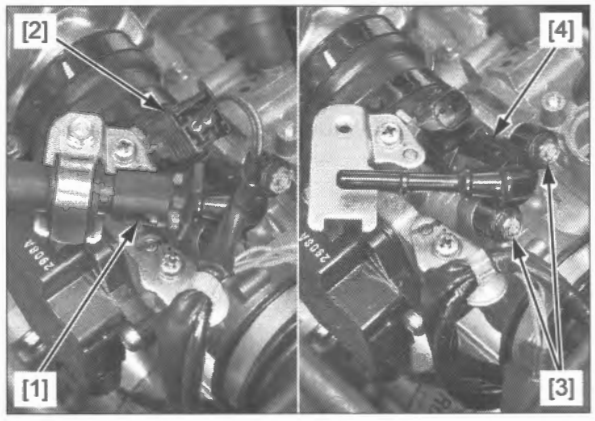
Remove the IACV (page 7-23).

Relieve the fuel pressure and disconnect the quick connect fitting [1] from the fuel injector (page 7-7).

Disconnect the fuel injector 2P connector [2].

- Gray ('14 – '19)
- Black (After '19)

Remove the fuel injector mounting bolts [3] and fuel injector assembly [4] from the throttle body.



Remove the fuel injector [1] from the injector joint [2].

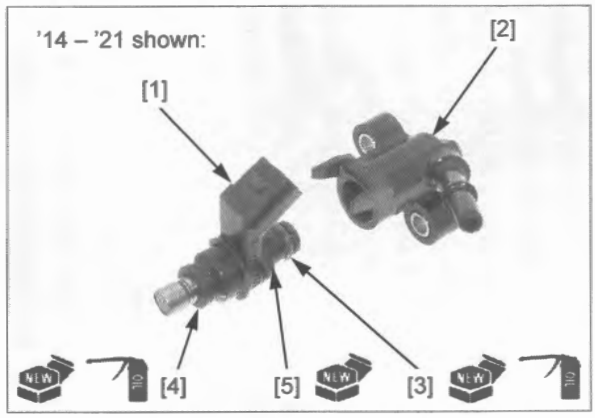
Remove the O-ring [3] and seal ring [4].

'14 – '21 models: Remove the dust seal ring [5].

Installation is in the reverse order of removal.

- Always replace the O-ring and cushion ring with new ones.
- Apply oil to the O-ring and cushion ring.

TORQUE:
Fuel injector mounting bolt:
5.1 N·m (0.5 kgf·m, 3.8 lbf·ft)



EVAP PURGE CONTROL SOLENOID VALVE (After '19 AC type)

REMOVAL/INSTALLATION

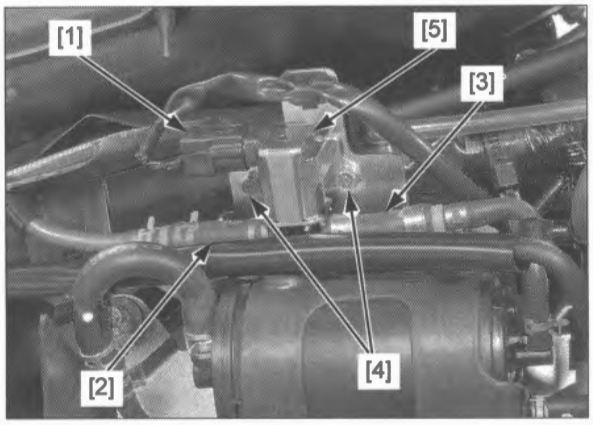
Remove the right center mudguard (page 2-5).

Disconnect the following:

- EVAP purge control solenoid valve 2P (Black) connector [1]
- EVAP purge control solenoid valve-to-throttle body hose [2]
- EVAP canister-to-EVAP purge control solenoid valve hose [3]

Remove the two bolts [4] and EVAP purge control solenoid valve [5].

Installation is in the reverse order of removal.



INSPECTION

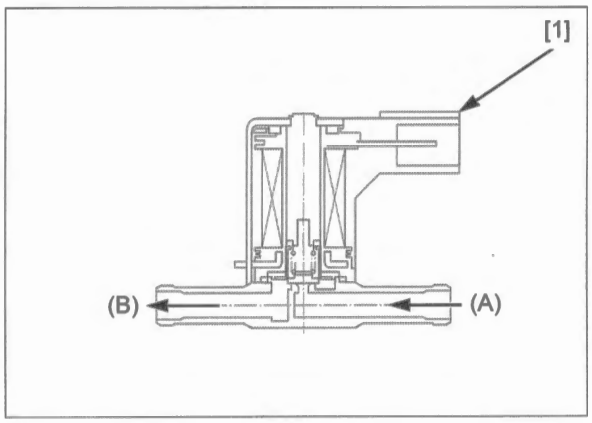
Remove the EVAP purge control solenoid valve (page 7-25).

Check the air flow through the solenoid valve.

Air should not flow from input hose fitting (A) to output hose fitting (B).

Connect a 12 V battery to the EVAP purge control solenoid valve 2P connector [1] terminals.

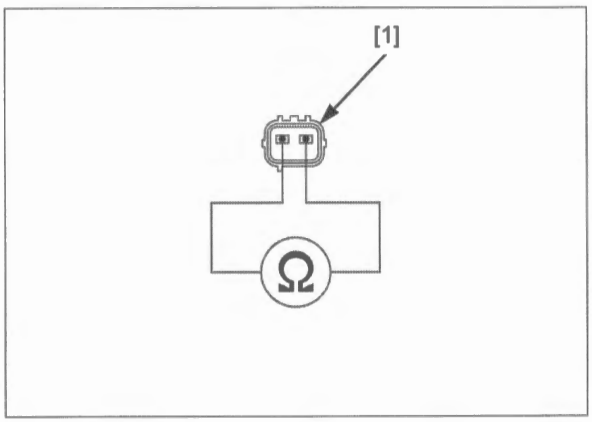
Air should flow when the battery is connected.



Measure the resistance between the 2P connector [1] terminals of the EVAP purge control solenoid valve.

STANDARD: 30 – 34 Ω (20°C/68°F)

If the resistance is out specification, replace the EVAP purge control solenoid valve.



EVAP CANISTER (After '19 AC type)

REMOVAL/INSTALLATION

Remove the following:

- right center mudguard (page 2-5)
- EVAP pure control solenoid valve (page 7-25)

Disconnect the air vent hose [1].

Release the harness clip [2].

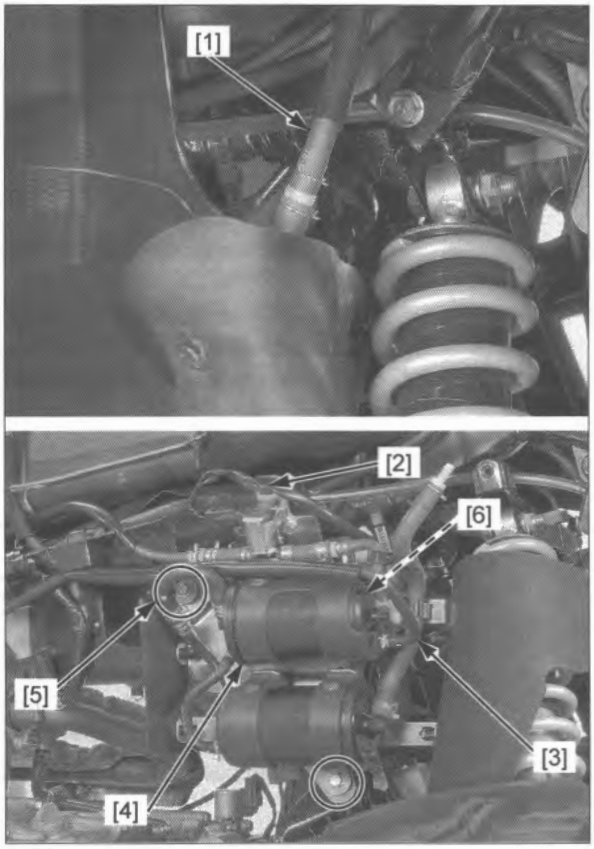
Disconnect the fuel pump breather hose [3] from the EVAP canister [4].

Remove the two bolts [5].

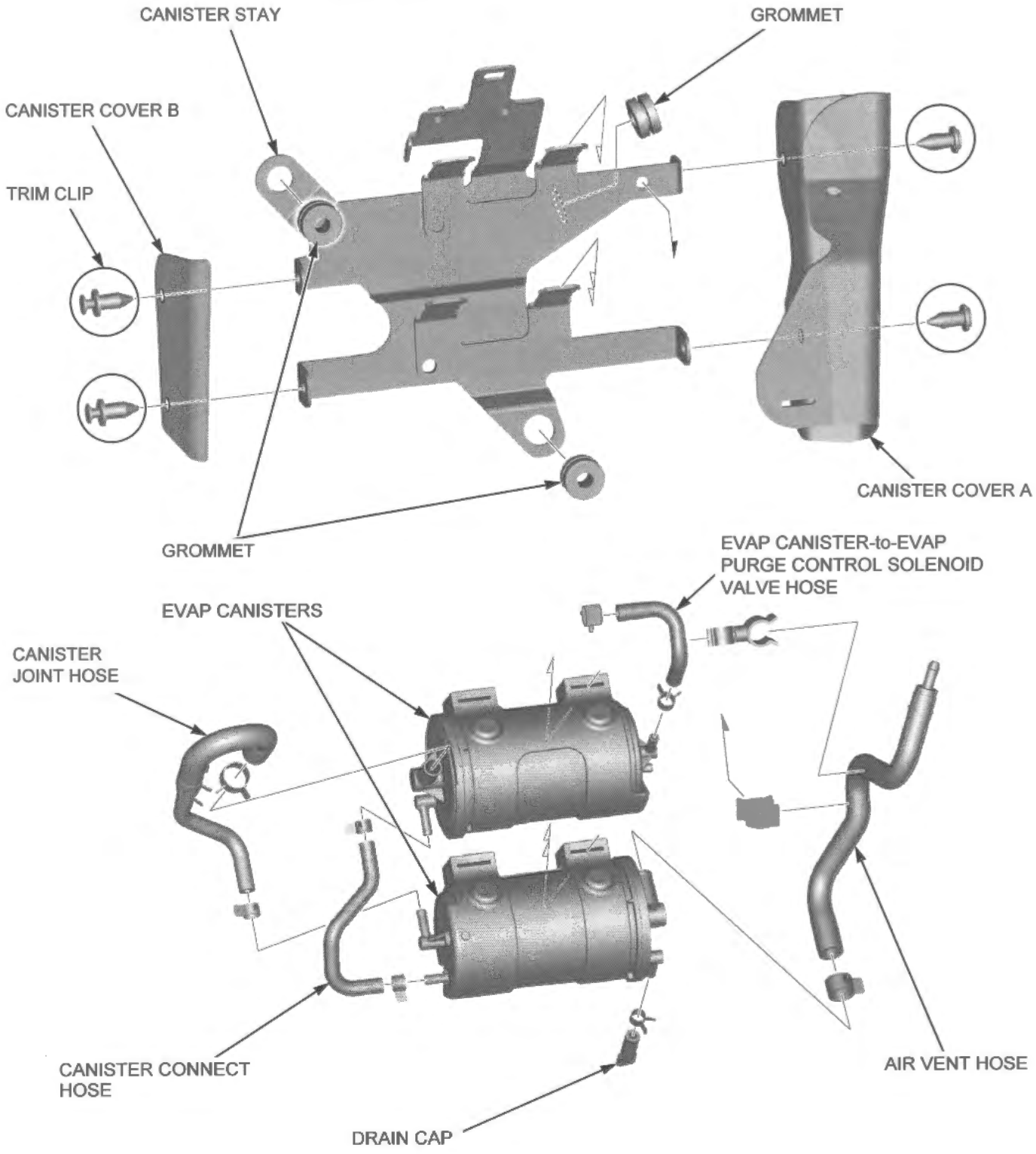
Release the boss [6] from the grommet.

Remove the EVAP canister assembly.

Installation is in the reverse order of removal.



DISASSEMBLY/ASSEMBLY



MEMO

8. COOLING SYSTEM

SERVICE INFORMATION 8-2

TROUBLESHOOTING 8-3

SYSTEM FLOW PATTERN 8-4

SYSTEM TESTING 8-5

COOLANT REPLACEMENT 8-5

THERMOSTAT 8-6

RADIATOR/COOLING FAN 8-7

RADIATOR RESERVE TANK 8-9

WATER PUMP 8-9

SERVICE INFORMATION

GENERAL

⚠WARNING

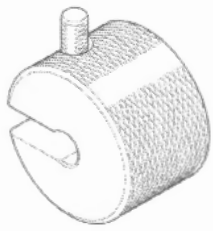
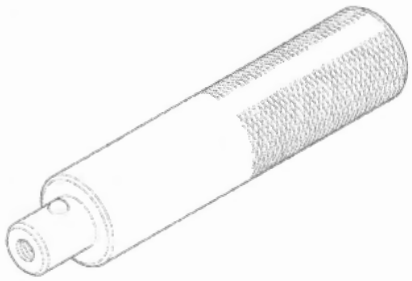
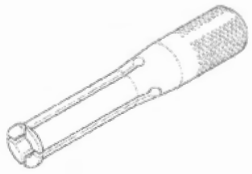
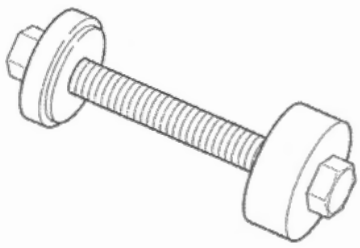
Removing the radiator cap while the engine is hot can allow the coolant to spray out, seriously scalding you.
Always let the engine and radiator cool down before removing the radiator cap.

NOTICE

Using coolant with silicate corrosion inhibitors may cause premature wear of water pump seals or blockage of radiator passages. Using tap water may cause engine damage.

- This section covers service of radiator and water pump. The service procedures in this section can be performed with the engine installed in the frame.
- Add cooling system at the reserve tank. Do not remove the radiator cap except to refill or drain the system.
- Avoid spilling coolant on painted surfaces.
- After servicing the system, check for leaks with a cooling system tester.
- For cooling fan motor inspection, refer to "Lights/Meters/Switches" section (page 24-18).

TOOLS

Remover Weight 07741-0010201  or 07936-371020A (U.S.A. only)	Driver 07749-0010000 	Remover Shaft, 15 mm 07936-KC10100  Not available in U.S.A.
Remover Head, 15 mm 07936-KC10200  Not available in U.S.A.	Bearing remover, 15 mm 07936-KC10500 (U.S.A. only) 	Oil Seal Driver Attachment 36 07945-4150400  Not available in U.S.A.
Mechanical seal installer 07965-415000A (U.S.A. only) 		

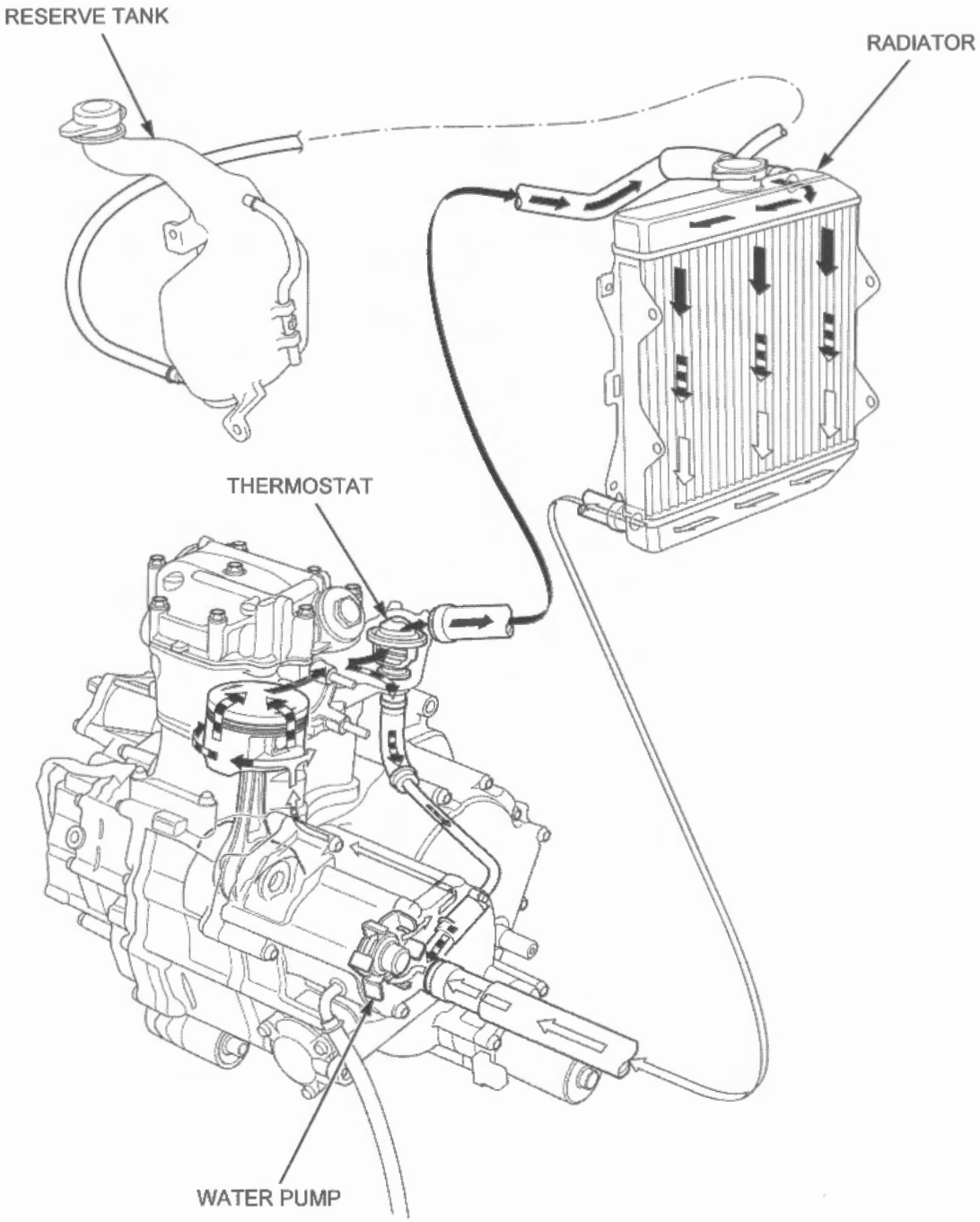
TROUBLESHOOTING

Engine temperature too high
- Thermostat stuck closed
- Faulty radiator cap
- Insufficient coolant
- Passage blocked in radiator, hoses or water jacket
- Air in system
- Faulty cooling fan motor
- Faulty water pump

Engine temperature too low
- Thermostat stuck open

Coolant leaks
- Faulty water pump mechanical seal
- Deteriorated O-rings
- Faulty radiator cap
- Damaged or deteriorated cylinder head gasket
- Loose hose connection or clamp
- Damaged or deteriorated hoses

SYSTEM FLOW PATTERN



SYSTEM TESTING

RADIATOR CAP/SYSTEM PRESSURE INSPECTION

Remove the radiator cap lid (page 2-3).

Remove the radiator cap [1].

Wet the sealing surfaces of the cap, then install the cap onto tester [2].

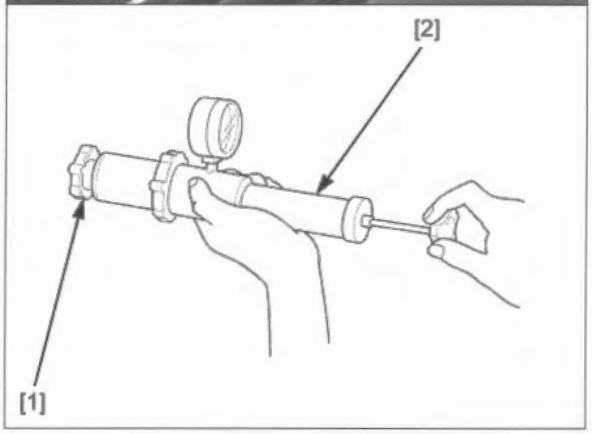
TOOLS:
Cooling system pressure tester SVTS4AH
Cooling system adaptor OTCJ33984A

Pressurize the radiator cap using the tester.
Replace the radiator cap if it does not hold pressure, or if relief pressure is too high or too low. It must hold the specified pressure for at least 6 seconds.

RADIATOR CAP RELIEF PRESSURE:
108 – 137 kPa (1.1 – 1.4 kgf/cm², 16 – 20 psi)

Pressurize the radiator, engine and hoses using the tester [2], and check for leaks.





NOTICE

Excessive pressure can damage the cooling system components. Do not exceed 137 kPa (1.4 kgf/cm², 20 psi).

Repair or replace components if the system will not hold the specified pressure for at least 6 seconds.

Remove the tester and install the radiator cap.

Install the radiator cap lid (page 2-3).

COOLANT REPLACEMENT

REPLACEMENT/AIR BLEEDING

- When filling the system with coolant, place the vehicle on level ground.

The engine must be cool before servicing the cooling system.

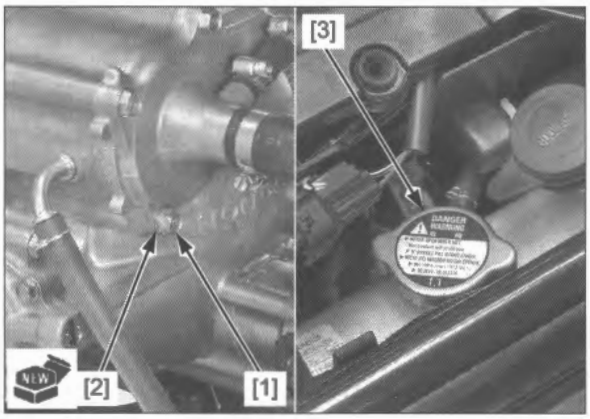
Remove the following:

– tank cover assembly (page 2-4)
– radiator cap lid (page 2-3)

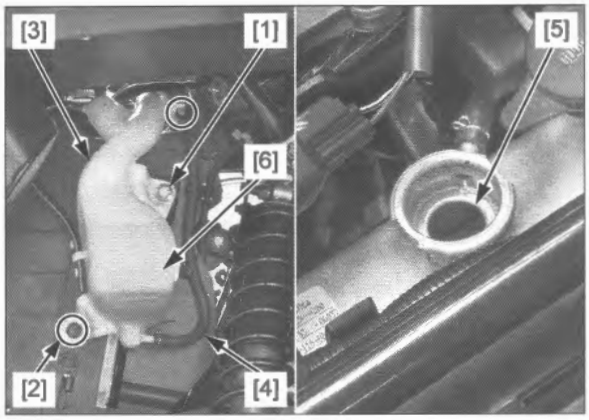
Place a funnel under the water pump to catch coolant in a container.

Drain the coolant from the system by removing the drain bolt [1] and sealing washer [2] on the water pump, and radiator cap [3].

Reinstall the drain bolt with a new sealing washer securely.



Remove the bolt [1], trim clips [2] and reserve tank [3], then open the tank cap and drain the tank.
Disconnect the siphon hose [4] to remove the tank.



Rinse the inside of the reserve tank with water.

Reconnect the siphon hose and install the reserve tank with the bolt and trim clips.

Fill the system with the recommended coolant up to the filler neck [5].

Bleed air from the system as follows:
1. Shift the transmission into neutral.
   Start the engine and let it idle for 2 – 3 minutes.
2. Snap the throttle 3 – 4 times to bleed air from the system.
3. Stop the engine and add coolant up to the filler neck.
4. Install the radiator cap.

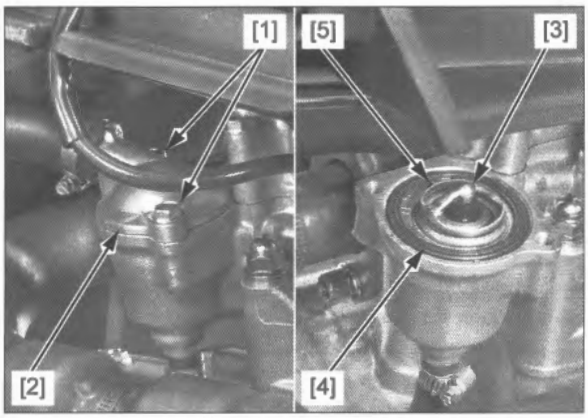
Fill the reserve tank to the upper level line [6] and install the tank cap.

Install the removed parts in the reverse order of removal.

THERMOSTAT

REMOVAL/INSTALLATION

Drain the coolant from the system (page 8-5).



Remove the bolts [1], thermostat cover [2] and thermostat [3].

Make sure the rubber seal [4] on the thermostat is in good condition.

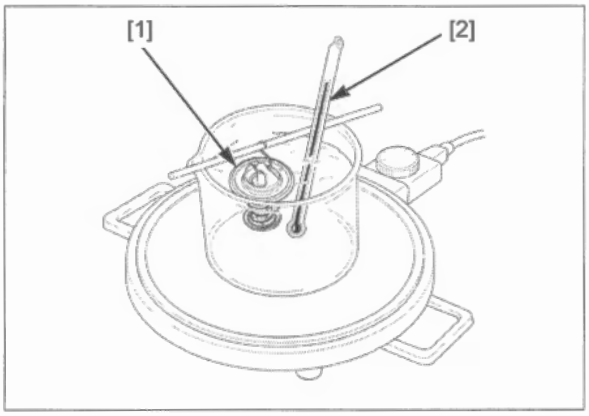
Installation is in the reverse order of removal.

- Apply coolant to the rubber seal.
- Install the thermostat into the housing with the bleed hole [5] facing inboard.

Fill and bleed the cooling system (page 8-5).

INSPECTION

Visually inspect the thermostat [1] for damage.
Replace the thermostat if the valve stays open at room temperature.



Do not let the thermostat or thermometer [2] touch the pan, or you will get a false reading.

Heat a container of water with an electric heating element for 5 minutes.
Suspend the thermostat in heated water to check its operation.

THERMOSTAT BEGIN TO OPEN:
80 – 84°C (176 – 183°F)

VALVE LIFT:
8 mm (0.3 in) minimum at 95°C (203°F)

Replace the thermostat if the valve opens at a temperature other than those specified.

RADIATOR/COOLING FAN

RADIATOR REMOVAL/INSTALLATION

NOTE:

- Take care not to damage the radiator fins while servicing the radiator.

Drain the coolant from the system (page 8-5).

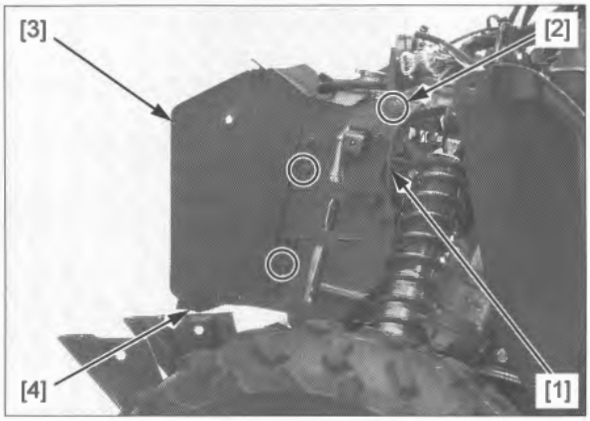
Remove the following:

- front fender/carrier (page 2-8)
- radiator reserve tank (page 8-9)
- FM2/FM6/FM7/FE2/FA6/FA7: EPS ECU (page 26-30)

Release the front final drive breather hose [1].

Remove the following:

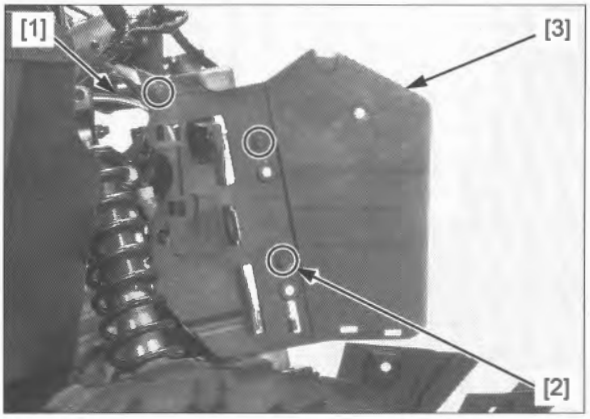
- trim clips [2]
- radiator grille cover [3]
- radiator grille center cover [4]



Release the fan motor breather hose [1] from the cover.

Remove the following:

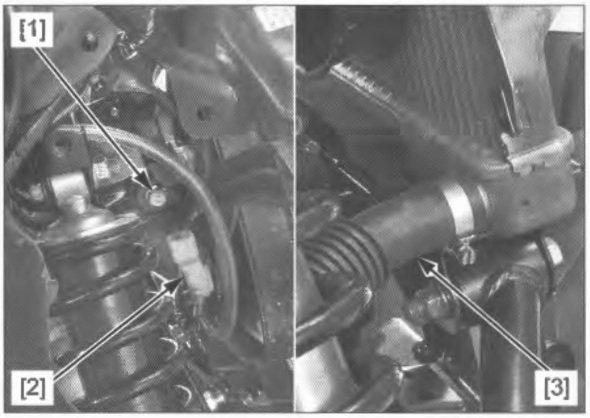
- trim clips [2]
- radiator grille cover [3]



Remove the bolt [1].

Disconnect the following:

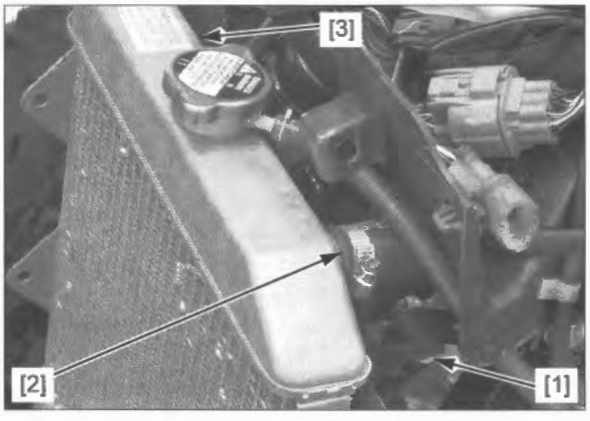
- fan motor 2P (natural) connector [2]
- water hose [3]



Remove the bolt [1].

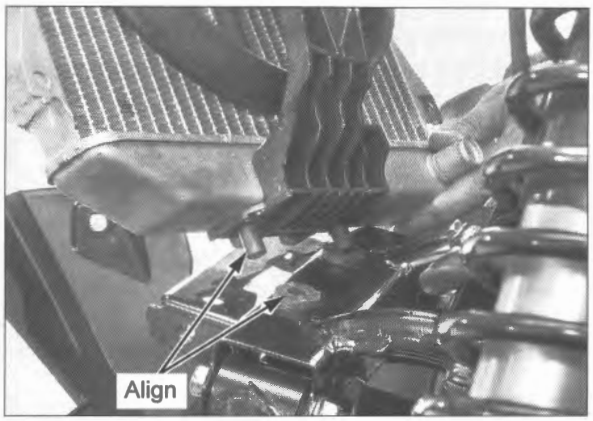
Disconnect the water hose [2].

Remove the radiator assembly [3].



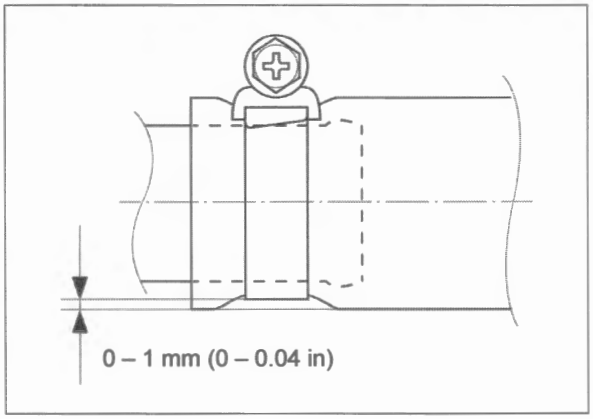
Installation is in the reverse order of removal.

- Install the radiator assembly aligning the bosses with the grommets.



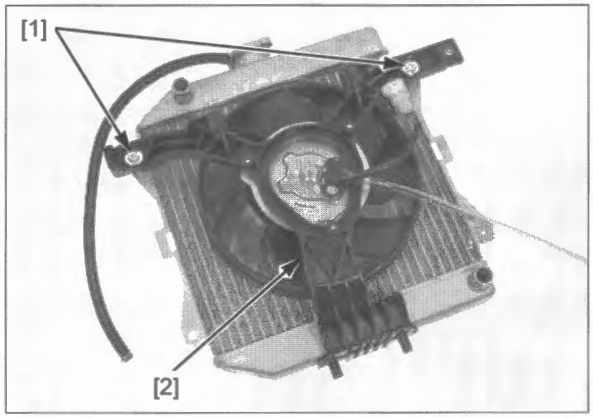
- Tighten the water hose band screw to the specified range as shown.

Fill and bleed the cooling system (page 8-5).

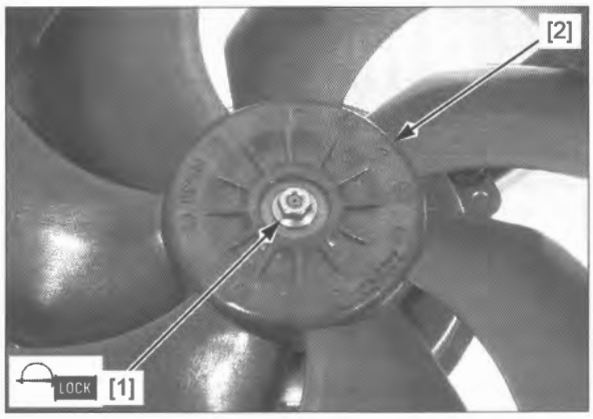


COOLING FAN REMOVAL/ INSTALLATION

Remove the washer-bolts [1] and motor/stay assembly [2].



Remove the nut [1] and cooling fan [2].



Remove the following:

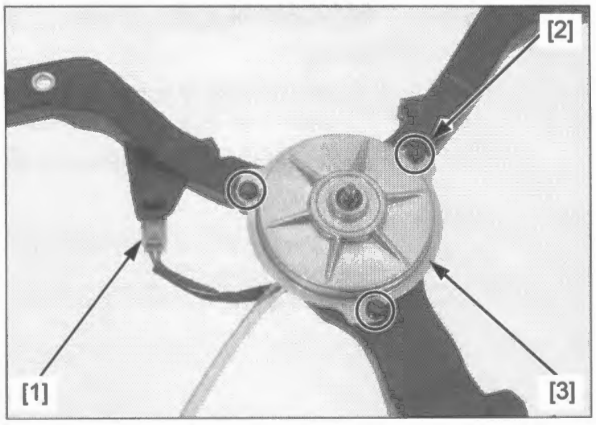
- connector [1] from the stay
- bolts [2]
- fan motor [3]

Installation is in the reverse order of removal.

- Apply locking agent to the cooling fan nut threads.

TORQUE:

Cooling fan nut:	**2.7 N·m (0.3 kgf·m, 2.0 lbf·ft)**
Fan motor bolt:	**5.2 N·m (0.5 kgf·m, 3.8 lbf·ft)**
Fan motor stay bolt:	**8.4 N·m (0.9 kgf·m, 6.2 lbf·ft)**



RADIATOR RESERVE TANK

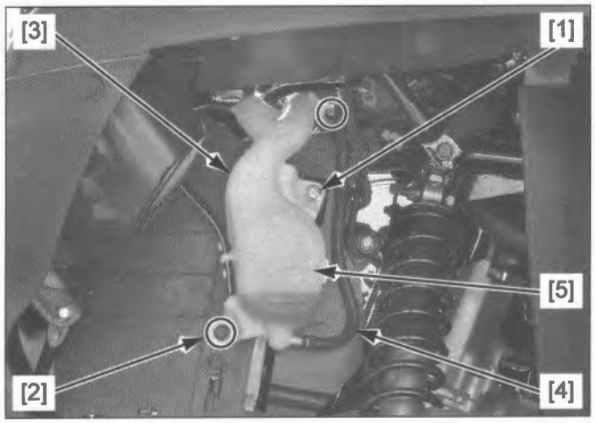
REMOVAL/INSTALLATION

Remove the radiator cap lid (page 2-3).

Remove the bolt [1], trim clips [2] and reserve tank [3], then open the tank cap and drain the tank.
Disconnect the siphon hose [4] to remove the tank.

Installation is in the reverse order of removal.

Fill the reserve tank to the upper level line [5] and install the tank cap.



WATER PUMP

MECHANICAL SEAL INSPECTION

Remove the tank cover assembly (page 2-4).

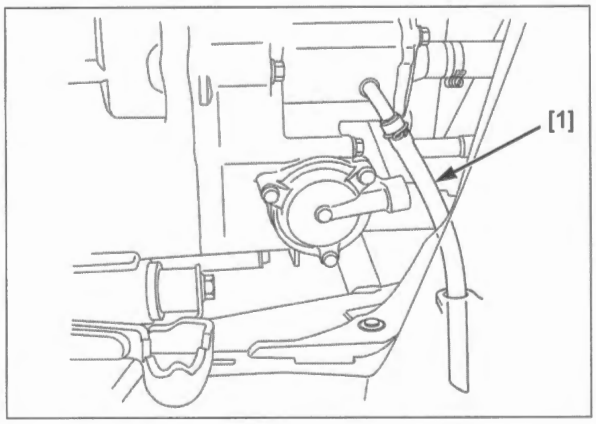
Check the bleed hose [1] of the water pump for signs of coolant leakage.

If water leaks through the bleed hose, replace the mechanical seal (page 8-10).
If oil leaks through the bleed hole, replace the oil seal (page 8-10).

Make sure that there is no continuous coolant leakage from the bleed hose while operating the engine.

NOTE:

- A small amount of coolant weeping from the bleed hose is normal.



MECHANICAL SEAL REPLACEMENT

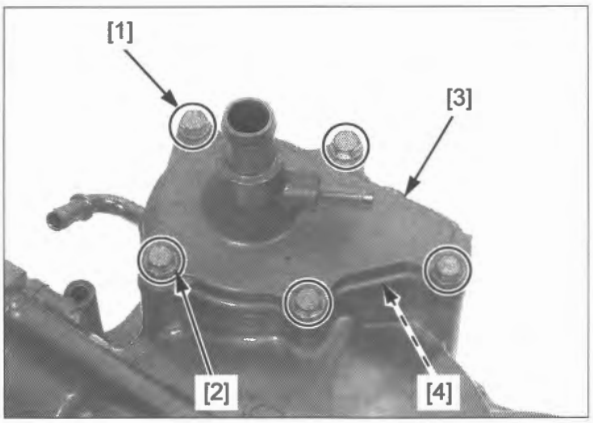
NOTE:

- When replacing the mechanical seal, the impeller and pump shaft must be replaced with new ones.

Remove the front crankcase cover (page 12-5).

Remove the following:

- bolts [1] and sealing washer [2]
- pump cover [3]
- O-ring [4] (from the cover)

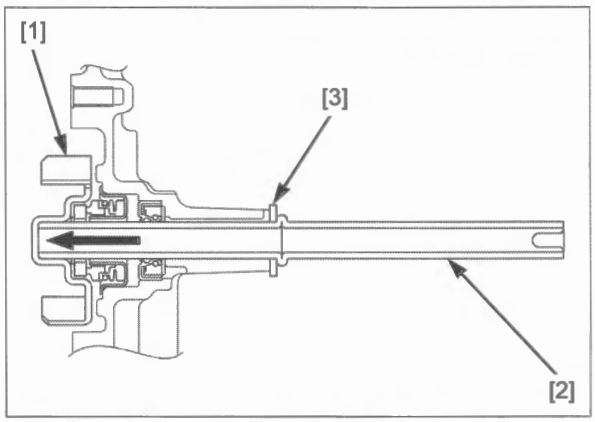


Remove the impeller assembly from the pump shaft by tapping the inside of the impeller [1] through the pump shaft [2], using a screwdriver or equivalent.

Remove the mating ring and cup gasket of the mechanical seal from the impeller.

Remove the following:

- pump shaft
- thrust washer [3]



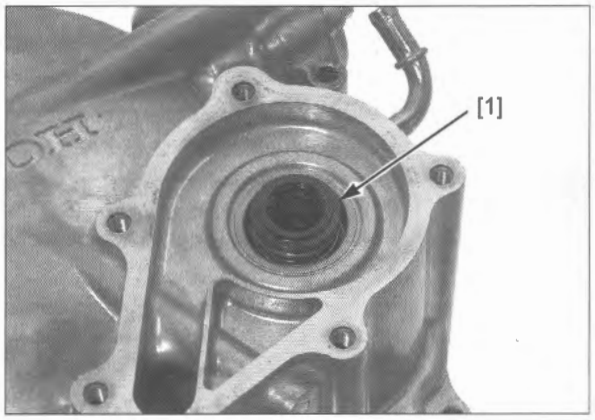
Remove the mechanical seal [1].

TOOLS:

Remover Head, 15 mm	**07936-KC10200**
Remover Shaft, 15 mm	**07936-KC10100**
Remover Weight	**07741-0010201**

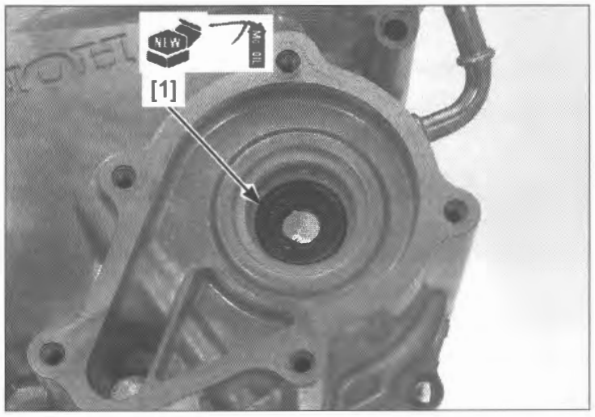
U.S.A. TOOLS:

Bearing remover, 15 mm	**07936-KC10500**
Remover weight	**07936-371020A**



Remove the oil seal [1].

Apply molybdenum oil solution to the lips of a new oil seal.
Install the oil seal with the flat side facing out until it is fully seated.

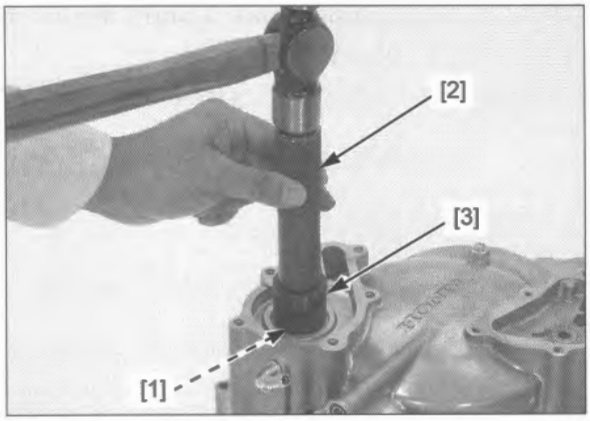


Be careful not to damage the sliding surface of the mechanical seal.

Drive a new mechanical seal [1] in until it is seated.

TOOLS:

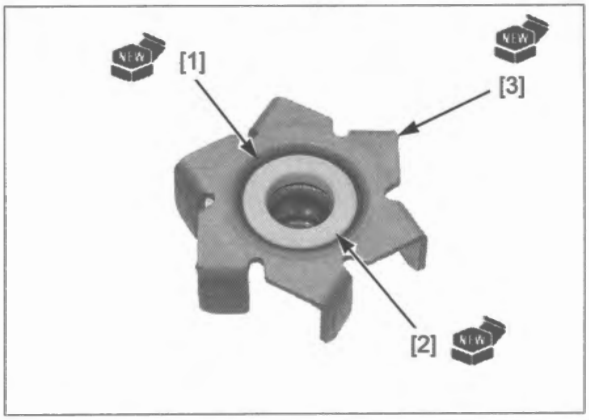
[2] Driver	**07749-0010000**
[3] Oil Seal Driver Attachment 36	**07945-4150400**
U.S.A. TOOL:	
Mechanical seal installer	**07965-415000A**



Be careful not to damage the sliding surface of the mating ring.

Install a new cup gasket [1] over a new mating ring [2].

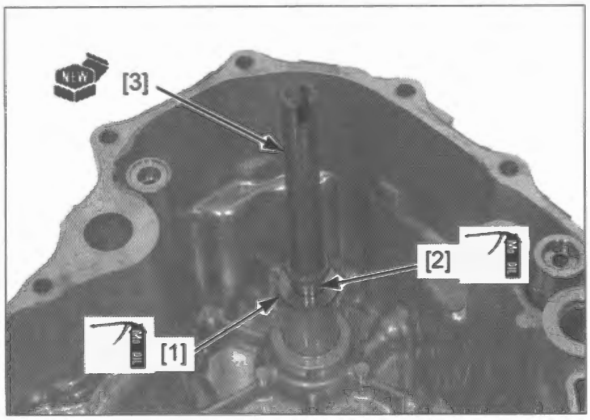
Apply coolant around the cup gasket. Install the gasket/ ring assembly into a new impeller [3] with the gasket facing the impeller until it is fully seated.



Do not get oil on the mechanical seal.

Apply molybdenum oil solution to the thrust washer [1] and the journal [2] of a new pump shaft [3].

Install the washer onto the pump shaft, and insert the shaft into the crankcase cover.

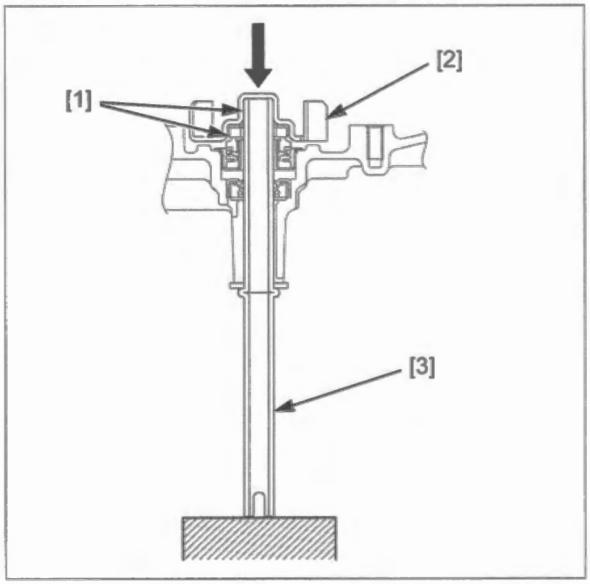


Never allow dirt or dust to get onto the sliding surfaces of the mechanical seal and mating ring.

Degrease [1] the press fitting areas of the impeller [2] and shaft [3], and the sliding surfaces of the mechanical seal and mating ring.

Press the impeller assembly onto the shaft.

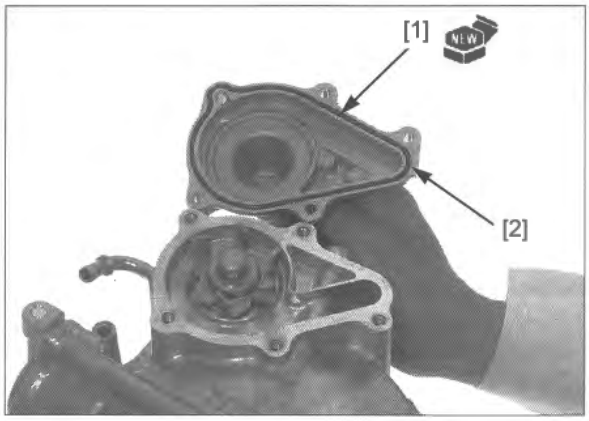
Check that the pump shaft turns smoothly without binding.



Install a new O-ring [1] into the cover [2] groove.

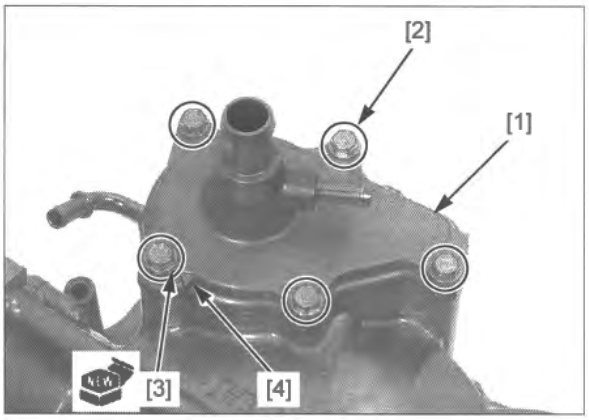
NOTE:

- Do not Apply engine oil to the O-ring.



Install the pump cover [1] and the bolts [2] with a new sealing washer [3] in position as shown (triangular mark [4]). Tighten the bolts in a crisscross pattern in several steps.

Install the front crankcase cover (page 12-7).



9. LUBRICATION SYSTEM

SERVICE INFORMATION 9-2

TROUBLESHOOTING 9-2

LUBRICATION SYSTEM DIAGRAM (FM/FE models) 9-3

LUBRICATION SYSTEM DIAGRAM (FA models) 9-4

OIL PUMP (FM/FE models) 9-5

RELIEF VALVE (FM/FE models) 9-5

OIL PRESSURE CHECK (FA models) 9-6

OIL PUMP/RELIEF VALVE (FA models) 9-7

SERVICE INFORMATION

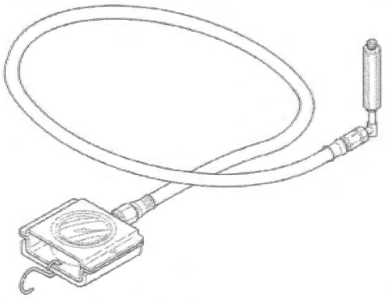
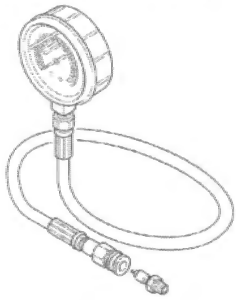
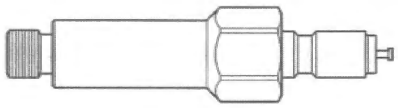
GENERAL

⚠CAUTION

Used engine oil may cause skin cancer if repeatedly left in contact with the skin for prolonged periods. Although this is unlikely unless you handle used oil on a daily basis, it is still advisable to thoroughly wash your hands with soap and water as soon as possible after handling used oil.

- This section covers service of the oil pump and relief valve. The service procedures in this section can be performed with the engine installed in the frame.
- When removing and installing the oil pump, use care not to allow dust or dirt to enter the engine.
- If any portion of the oil pump is worn beyond the specified service limits, replace the oil pump as an assembly.
- For following service, see Maintenance section.
  – oil level check and oil change (page 3-13)
  – oil filter replacement (page 3-14)

TOOLS

Oil pressure gauge set 07406-0070002	Oil Pressure Gauge, 160 psi 07ZMJ-HN2A100 (U.S.A. only)	Adapter, 25 L x 8 x1.25 MM 07AMJ-HP7A100 (U.S.A. only)
 Not available in U.S.A.		

TROUBLESHOOTING

Oil level too low – high oil consumption
- Oil consumption
- External oil leak
- Worn piston rings or incorrect piston ring installation
- Worn cylinder
- Worn valve guides or stem seals

Low oil pressure (only for FA models)
- Oil level low
- Oil pressure relief valve wear
- Clogged oil strainer or filter
- Faulty oil pump
- Internal oil leak
- Incorrect oil being used

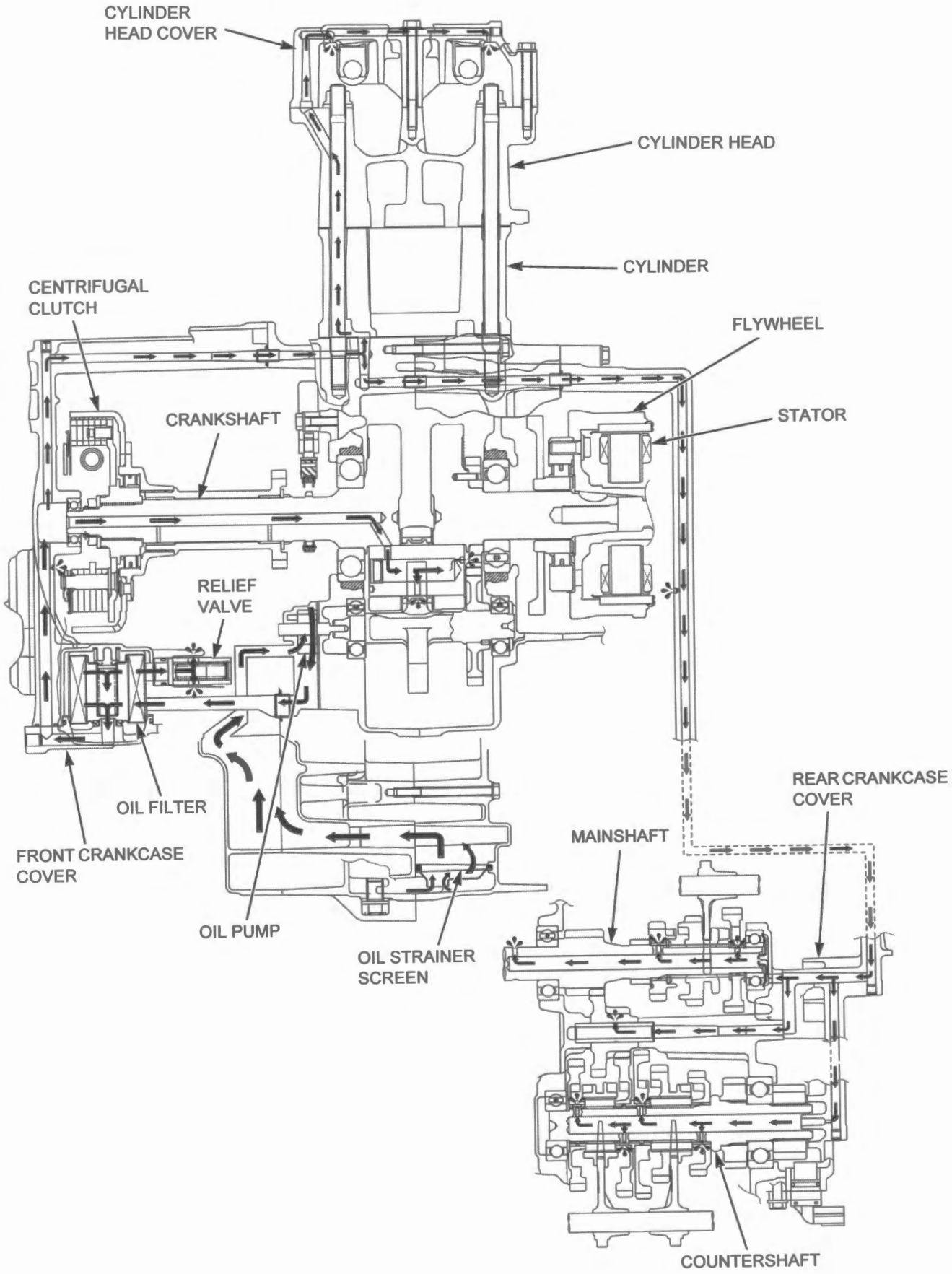
No oil pressure (only for FA models)
- Oil level too low
- Oil pressure relief valve stuck open
- Damaged oil pump
- Internal oil leak

High oil pressure (only for FA models)
- Oil pressure relief valve stuck closed
- Clogged oil gallery or orifice
- Incorrect oil being used

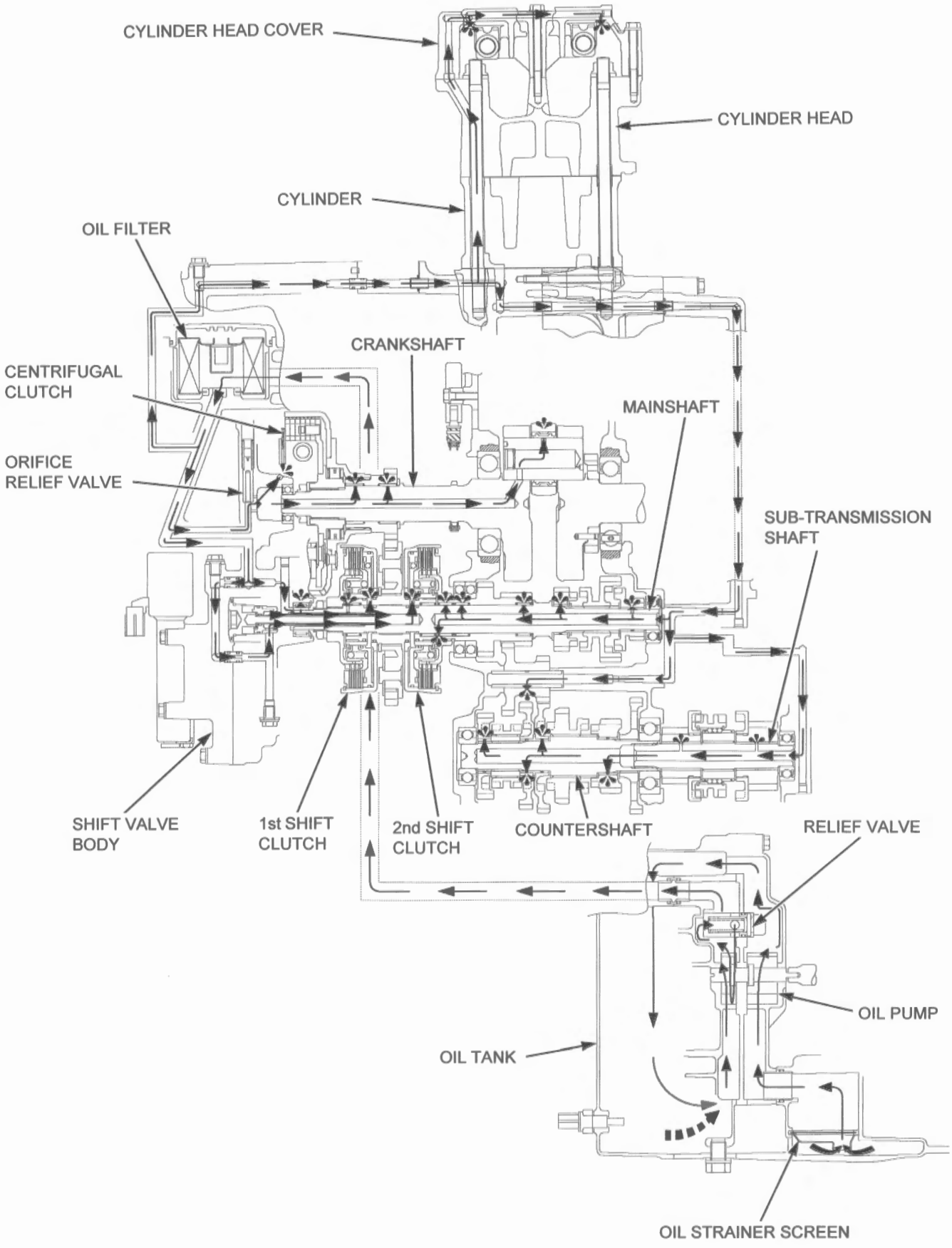
Oil contamination
- Oil or filter not changed often enough
- Worn piston rings or incorrect piston ring installation
- Worn valve guides or stem seals

Oil emulsification
- Blown cylinder head gasket
- Leaky coolant passage
- Water entry

LUBRICATION SYSTEM DIAGRAM (FM/FE models)



LUBRICATION SYSTEM DIAGRAM (FA models)



OIL PUMP (FM/FE models)

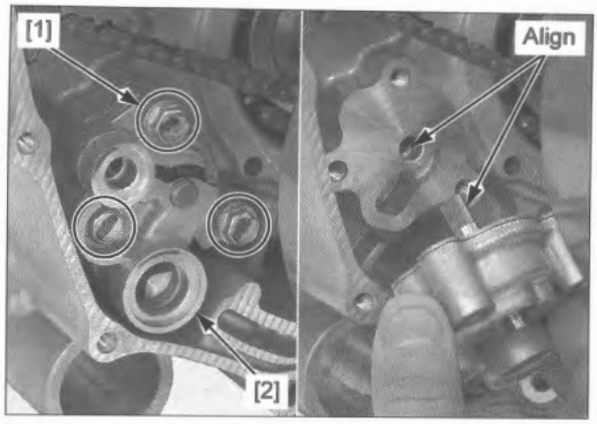
REMOVAL/INSTALLATION

Remove the front crankcase cover (page 12-5).

Remove the bolts [1] and oil pump [2].

Installation is in the reverse order of removal.

- Install the oil pump onto the crankcase while aligning the pump shaft end with the balancer shaft groove.



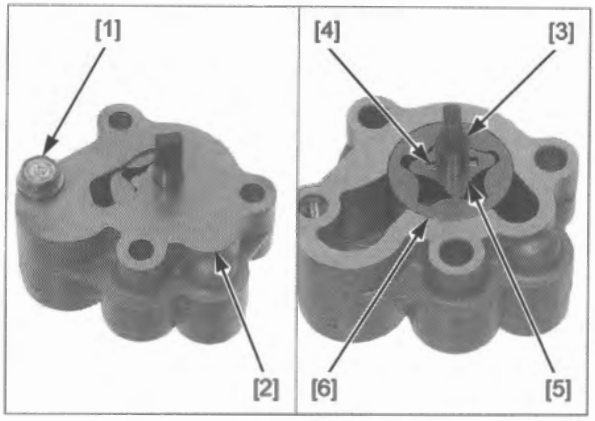
DISASSEMBLY/ASSEMBLY

Remove the following:

- bolt [1]
- side plate [2]
- pump shaft [3]
- drive pin [4]
- inner rotor [5]
- outer rotor [6]

Installation is in the reverse order of removal.

- Dip all parts in clean engine oil.



INSPECTION

Inspect the following parts for damage, abnormal wear, deformation or burning.

- pump shaft
- side plate
- inner rotor/outer rotor
- oil pump body

Measure the tip clearance according to LUBRICATION SYSTEM SPECIFICATIONS (page 1-11).
If any of the measurement is out of the service limit, replace the oil pump as an assembly.

RELIEF VALVE (FM/FE models)

REMOVAL/INSTALLATION

Remove the front crankcase cover (page 12-5).

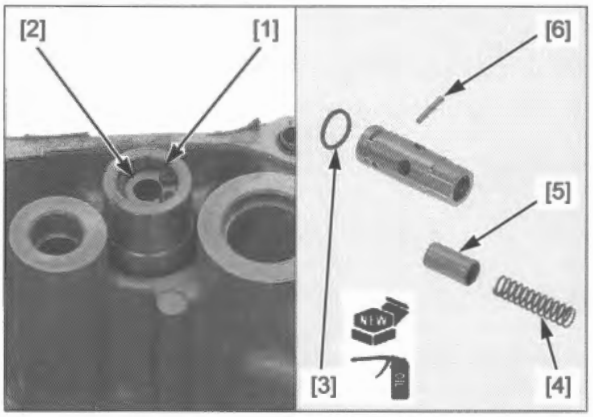
Remove the following:

- snap ring [1]
- washer [2]
- O-ring [3]
- spring [4]
- relief valve [5]
- pin [6]

Check the relief valve and spring for wear or damage. Replace the relief valve assembly if necessary.

Installation is in the reverse order of removal.

- Always replace the O-ring with a new one.
- Coat a new O-ring with oil.



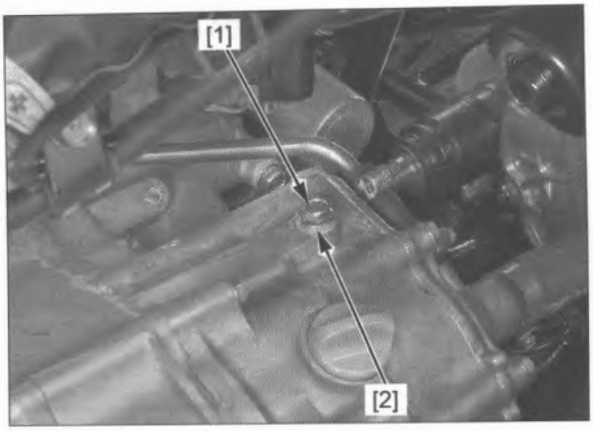
OIL PRESSURE CHECK (FA models)

Failure to warm the engine will cause very high oil pressure readings. External leaks will cause low oil pressure readings.

Check the oil level and add the recommended oil if necessary (page 3-13).
Also, warm the engine to normal operating temperature and check for external leaks.

Remove the tank cover assembly (page 2-4).

Remove the oil gallery sealing bolt [1] and washer [2] on the right side of the front crankcase cover.



NOTE:

- Clean around the sealing bolt with compressed air before removing the bolt, and be sure that no dirt enters the oil gallery.

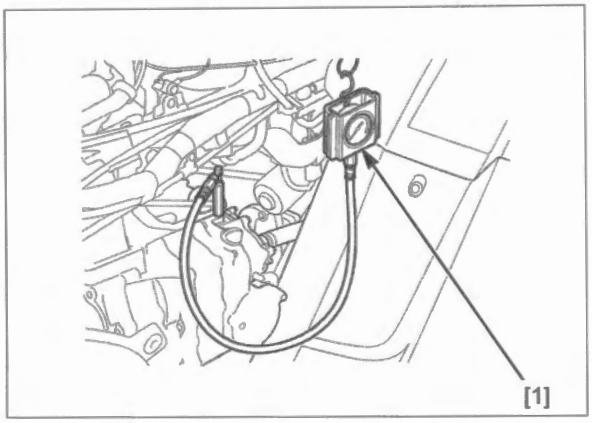
Connect an oil pressure gauge and adapter to the oil gallery hole.

TOOL:

[1] Oil pressure gauge set	**07406-0070002**

U.S.A. TOOLS:

Oil Pressure Gauge, 160 psi	**07ZMJ-HN2A100**
Adapter, 25 L x 8 x 1.25 MM	**07AMJ-HP7A100**



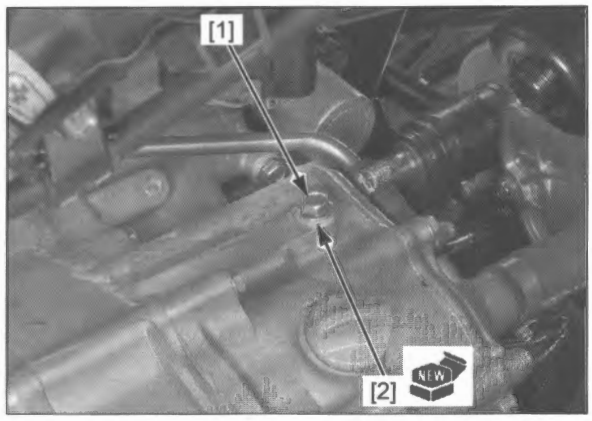
Start the engine and check the oil pressure.

OIL PRESSURE (80°C/176°F):
510 kPa (5.2 kgf/cm², 74 psi) at 5,000 rpm

Stop the engine and remove the oil pressure gauge and hose.

Install the sealing bolt [1] with a new sealing washer [2] and tighten the bolt securely.

Start the engine and make sure there are no oil leaks.



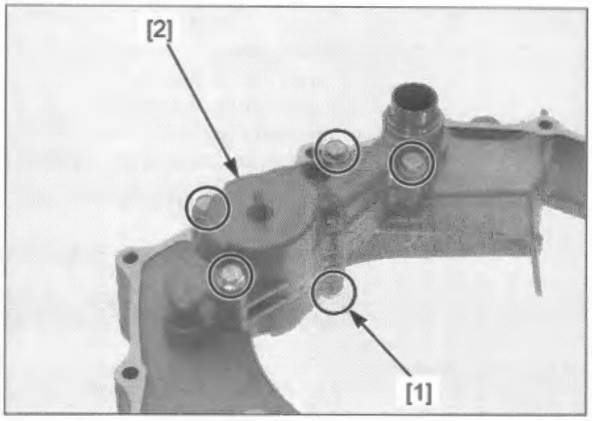
OIL PUMP/RELIEF VALVE (FA models)

DISASSEMBLY

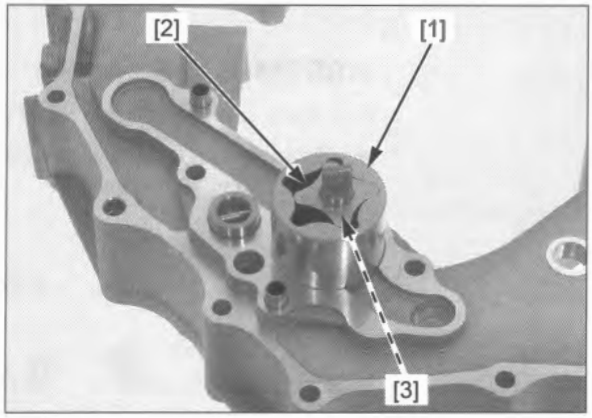
Remove the front crankcase cover and spacer (page 13-44).

Remove the following:

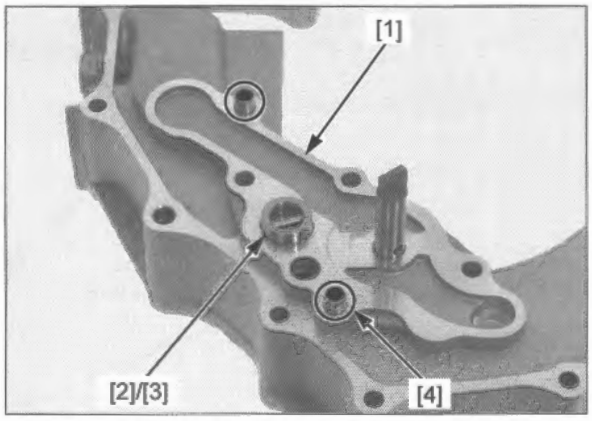
- five bolts [1]
- oil pump body A [2]



- outer rotor C [1]
- inner rotor C [2]
- drive pin [3]

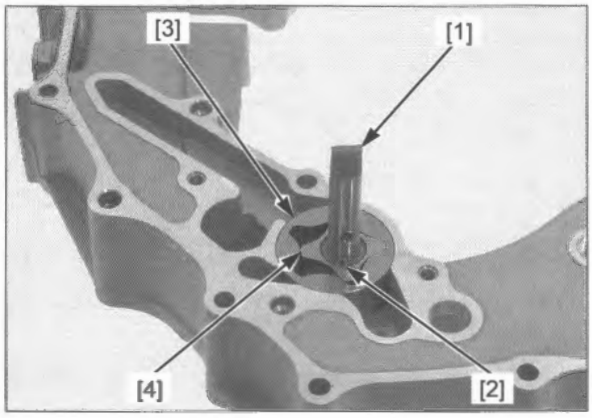


- oil pump body B [1]
- pressure relief valve [2]
- O-ring [3] (from the relief valve)
- two dowel pins [4]



- oil pump shaft [1]
- drive pin [2]
- outer rotor A [3]
- inner rotor A [4]

Clean all the disassembled parts thoroughly.



INSPECTION

Inspect the following parts for abnormal wear or damage. Replace or clean if necessary.

- oil pump shaft
- drive pins
- inner rotors A and C
- outer rotors A and C
- oil pump body B
- front crankcase cover spacer (oil pump body)

Check the operation of the relief valve by pushing on the piston.
Replace the relief valve assembly if necessary.

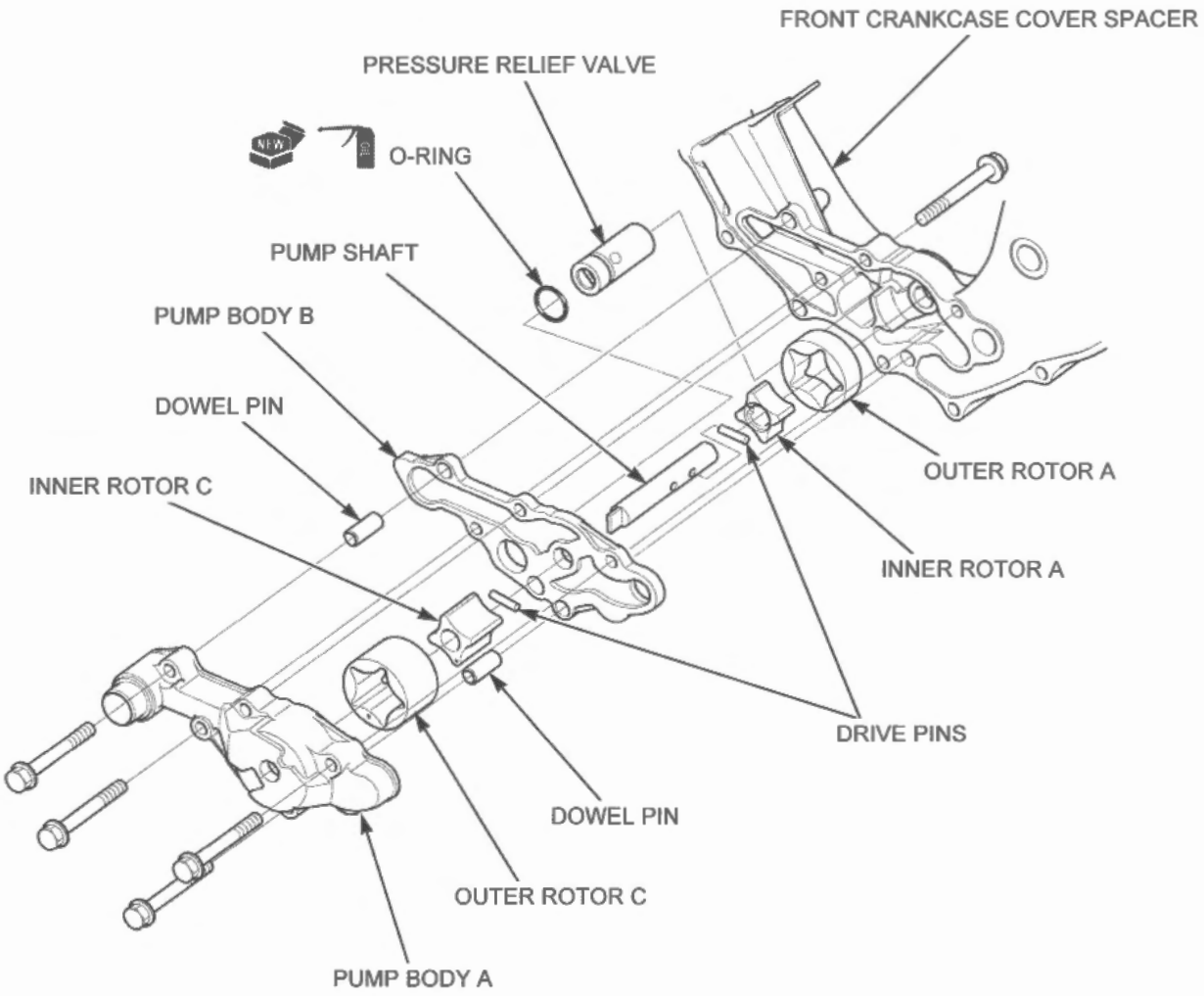
Measure the oil pump clearances according to LUBRICATION SYSTEM SPECIFICATIONS (page 1-11).

If any of the measurement is out of the service limit, replace the oil pump as an assembly.

ASSEMBLY

Assembly is in the reverse order of disassembly.

- Replace the O-ring with a new one.
- Coat O-ring with engine oil.



10. CYLINDER HEAD/VALVE

SERVICE INFORMATION 10-2

TROUBLESHOOTING 10-3

SYSTEM COMPONENTS 10-4

CYLINDER COMPRESSION 10-6

CYLINDER HEAD COVER 10-6

CYLINDER HEAD 10-10

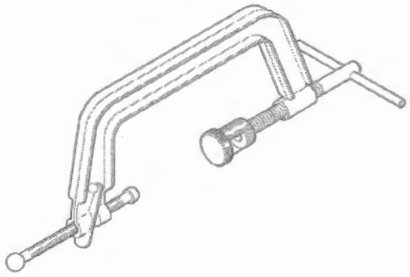
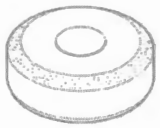
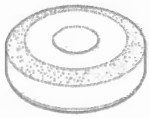
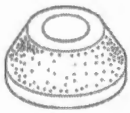
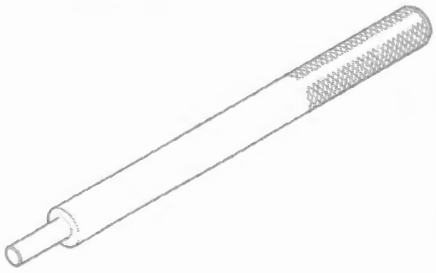
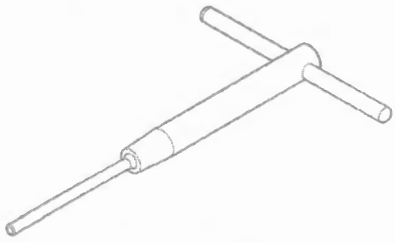
CAMSHAFT 10-16

SERVICE INFORMATION

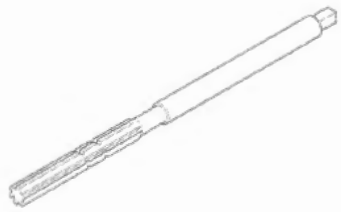
GENERAL

- This section covers service of the rocker arms, cylinder head, valves and camshaft. These services can be done with the engine installed in the frame.
- When disassembling, mark and store the disassembled parts to ensure that they are reinstalled in their original locations.
- Clean all disassembled parts with cleaning solvent and dry them by blowing them off with compressed air before inspection.
- Rocker arm and valve lubricating oil is fed through oil passages in the cylinder head and head cover. Clean the oil passages before assembling cylinder head.
- Be careful not to damage the mating surfaces when removing the cylinder head cover and cylinder head. Do not strike the cylinder head too hard during removal.

TOOLS

Valve Spring Compressor Set 07757-0010000 	Seat Cutter 40 mm (45° IN) 07780-0010500  or equivalent commercially available in U.S.A.	Seat Cutter 33 mm (45° EX) 07780-0010800  or equivalent commercially available in U.S.A.
Flat Cutter 38.5 mm (32° IN) 07780-0012400  or equivalent commercially available in U.S.A.	Flat Cutter 33 mm (32° EX) 07780-0012900  or equivalent commercially available in U.S.A.	Interior Cutter 37.5 mm (60° IN) 07780-0014100  or equivalent commercially available in U.S.A.
Interior Cutter 34 mm (60° EX) 07780-0014700  or equivalent commercially available in U.S.A.	Valve Guide Driver 6.0 x 11.5 07942-6570100 	Cutter Holder 6.0 07VMH-MBB0100  or equivalent commercially available in U.S.A.

Valve Guide Reamer 6.012
07VMH-MBB0200



or 07VMH-MBB020A (U.S.A. only)

TROUBLESHOOTING

- Engine top-end problems usually affect engine performance. These problems can be diagnosed by a compression test, or by tracing top-end noise with a sounding rod or stethoscope.
- If the performance is poor at low speeds, check for a white smoke in the air cleaner housing drain tube. If the hose is smoky, check for seized piston ring (page 11-3).

Compression too low, hard starting or poor performance at low speed
- Valves
  - Incorrect valve adjustment
  - Burned or bent valves
  - Incorrect valve timing
  - Broken valve spring
  - Uneven valve seating
  - Valve stuck open
- Cylinder head
  - Leaking or damaged cylinder head gasket
  - Warped or cracked cylinder head
  - Loose spark plug
- Cylinder/piston problem (page 11-2)

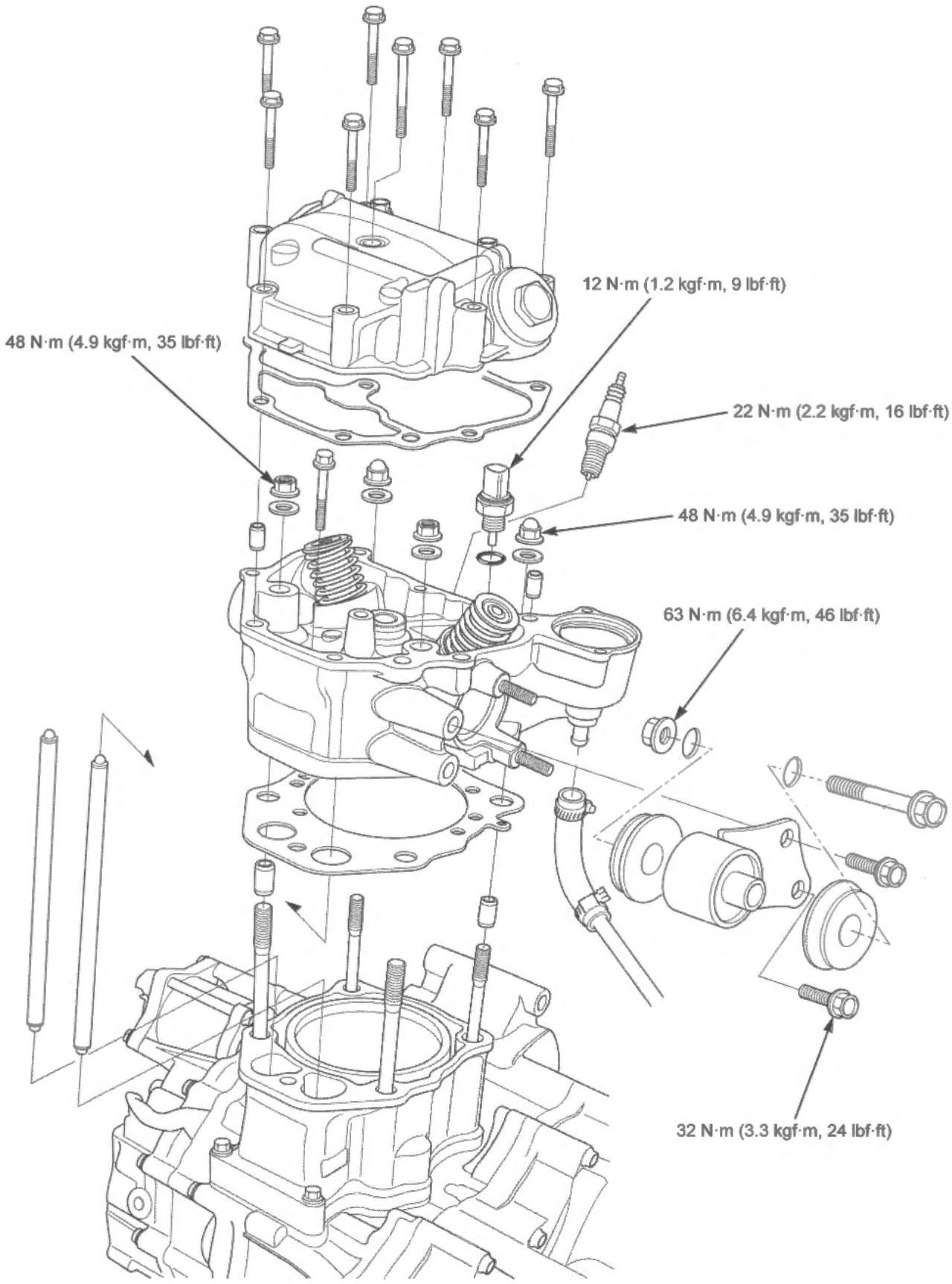
Compression too high
- Excessive carbon build-up on piston head or combustion chamber
- Worn or damaged decompressor system

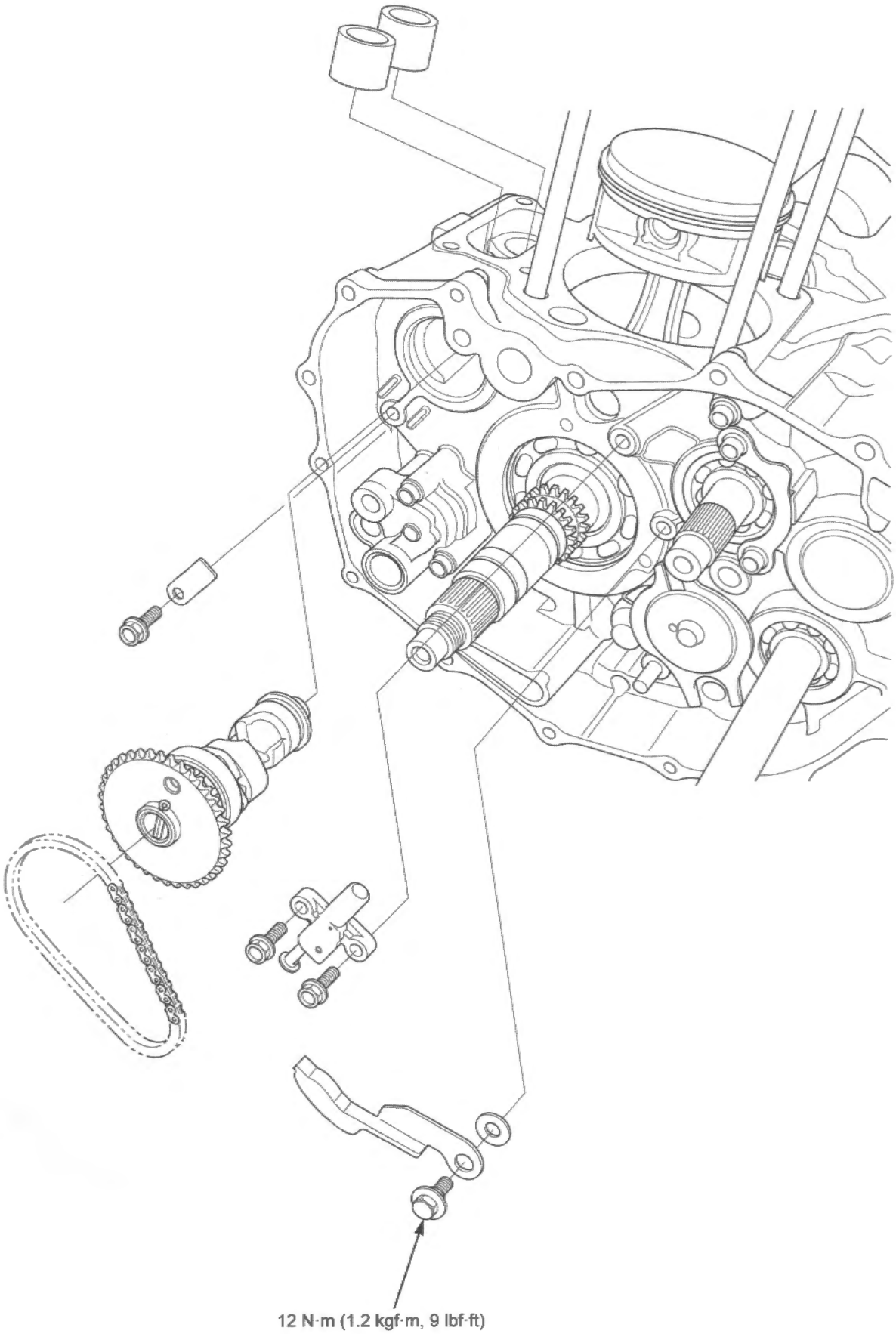
Excessive smoke
- Worn valve stem or valve guide
- Damaged stem seal
- Cylinder/piston problem (page 11-2)

Excessive noise
- Incorrect valve clearance
- Sticking valve or broken valve spring
- Excessively worn valve seat
- Worn or damaged camshaft
- Worn rocker arm and/or shaft
- Worn rocker arm follower or valve stem end
- Worn or damaged push rod and/or cam follower
- Worn cam chain
- Worn or damaged cam chain tensioner
- Worn cam sprocket teeth
- Cylinder/piston problem (page 11-2)

Rough idle
- Low cylinder compression

SYSTEM COMPONENTS



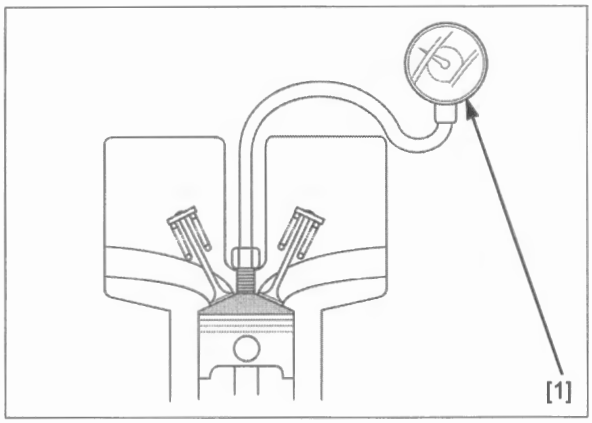

12 N·m (1.2 kgf·m, 9 lbf·ft)

CYLINDER COMPRESSION

Warm up the engine to normal operating temperature.

Stop the engine and remove the spark plug (page 3-7). Install the compression gauge [1] into the spark plug hole.

Shift the transmission into neutral.
Open the throttle all the way and crank the engine with the starter motor until the gauge reading stops rising. The maximum reading is usually reached within 4 – 7 seconds.



The cylinder compression specification is comparatively low because the camshaft has a decompression device installed.

COMPRESSION PRESSURE:
680 kPa (6.9 kgf/cm², 99 psi) at 450 rpm

Check that there is no leakage at the gauge connection.

Low compression can be caused by:
- blown cylinder head gasket
- improper valve adjustment
- valve leakage
- worn piston ring or cylinder

High compression can be caused by:
- carbon deposits in combustion chamber or on piston head

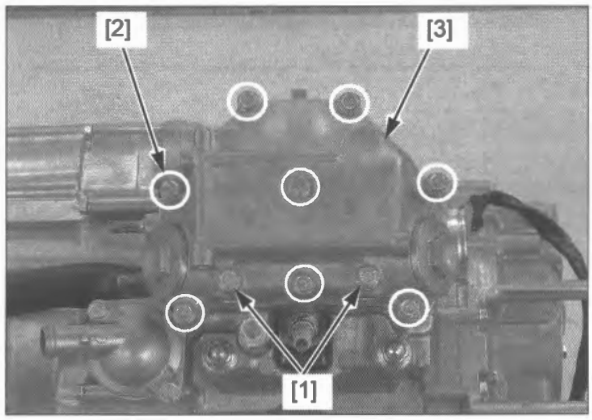
CYLINDER HEAD COVER

REMOVAL

Set the piston position to Top Dead Center on the compression stroke (page 3-8).

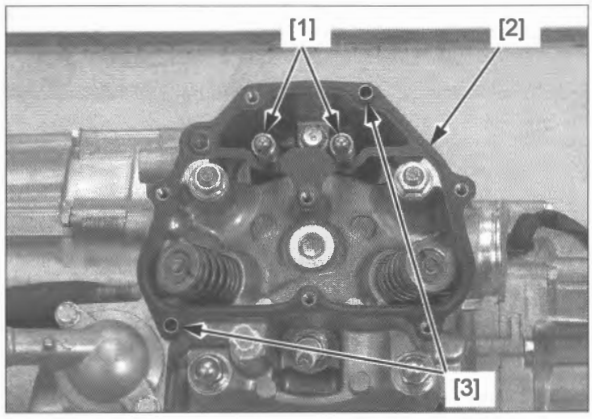
If you plan to remove the rocker arms, loosen the two rocker arm shaft retaining bolts [1].

Remove the following:
- eight cylinder head cover bolts [2]
- cylinder head cover [3]



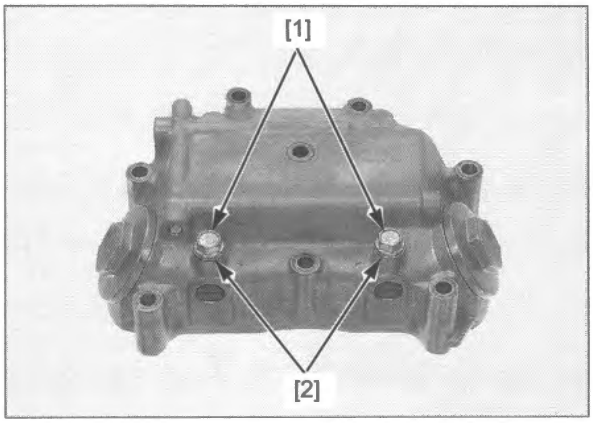
Mark the push rods so they can be placed back in their original locations.

- push rods [1]
- gasket [2]
- two dowel pins [3]



DISASSEMBLY

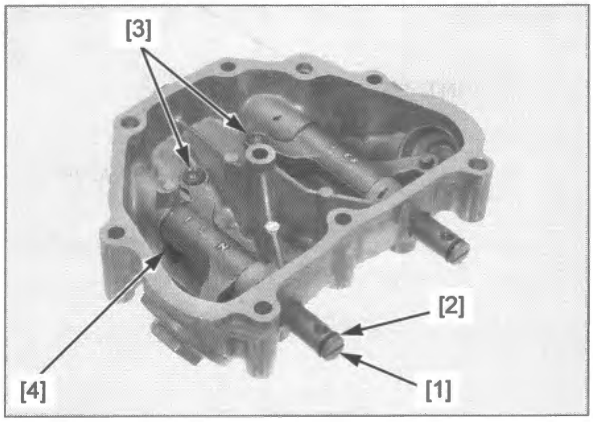
Remove the two rocker arm shaft retaining bolts [1] and sealing washers [2].



Push each rocker arm shaft [1] with a small screwdriver through the bolt hole until the O-ring [2] on the shaft is removed out of the head cover.

Remove the following:

- rocker arm shafts
- rocker arms [3]
- setting plates [4]
- O-rings



INSPECTION

ROCKER ARM/SHAFT

Inspect the following parts for damage, abnormal wear, deformation, burning or clogs in oil passages.

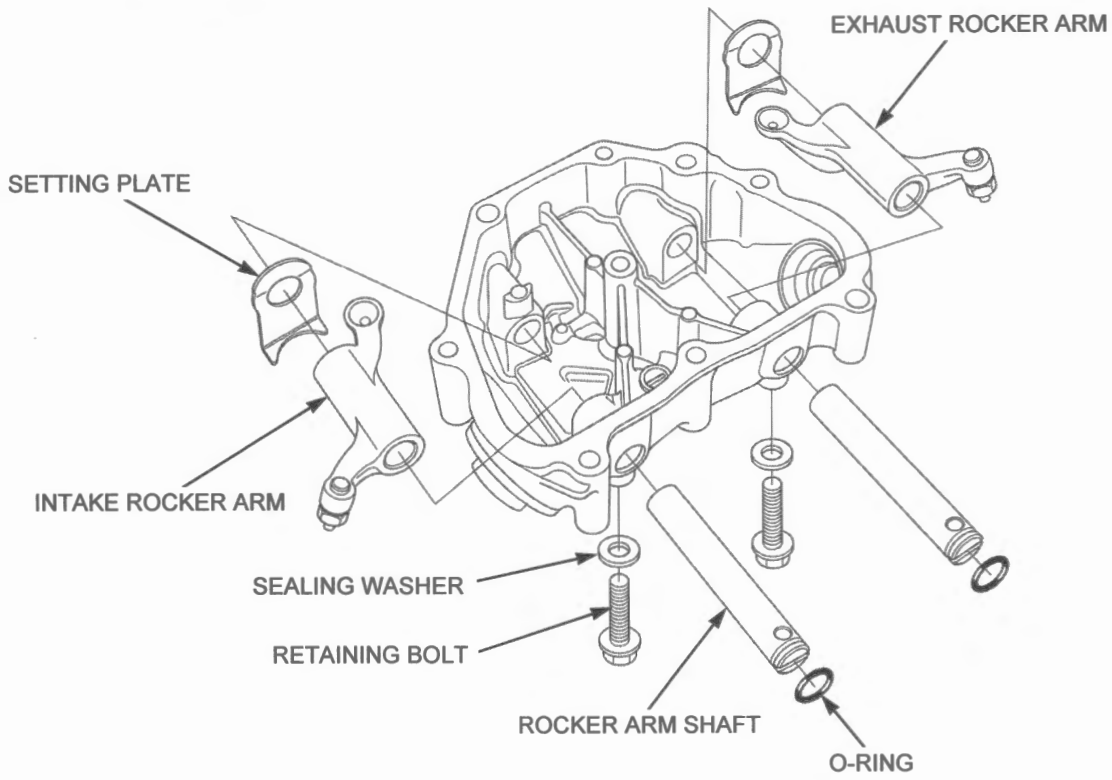
- Rocker arm
- Rocker arm shaft
- Push rod

Measure each part according to CYLINDER HEAD/ VALVE SPECIFICATIONS (page 1-12).

Replace any part if it is out of service limit.

If the push rod is worn or damaged, check the cam follower and camshaft (page 10-16).

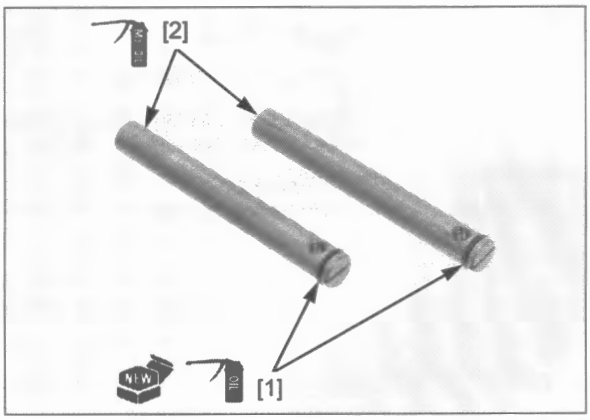
ASSEMBLY



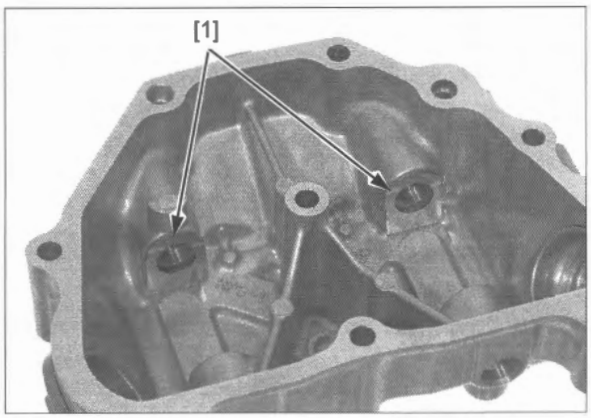
Blow through the oil passages in the cylinder head cover with compressed air.

Coat new O-rings [1] with engine oil and install them into the grooves in the rocker arm shafts [2].

Apply molybdenum oil solution to the sliding surfaces of the rocker arm shafts.



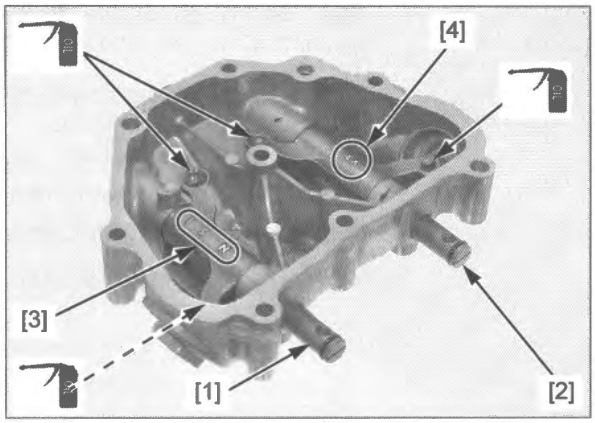
Place the setting plates [1] on the cylinder head cover as shown.



Apply oil to the rocker arm followers and adjusting screw tips.

Install the intake rocker arm [1] and exhaust rocker arm [2] properly, and insert the rocker arm shafts.

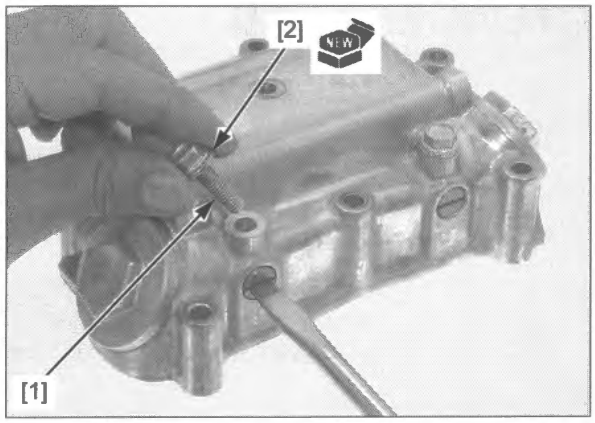
NOTE:
Intake rocker arm has "IN" mark [3] and exhaust rocker arm has "EX" mark [4].



Align the bolt holes in the cylinder head cover and rocker arm shaft by turning the shaft with a screwdriver.

Loosely install the rocker arm shaft retaining bolts [1] with new sealing washers [2].

- Tighten the retaining bolts securely after installing the cylinder head.

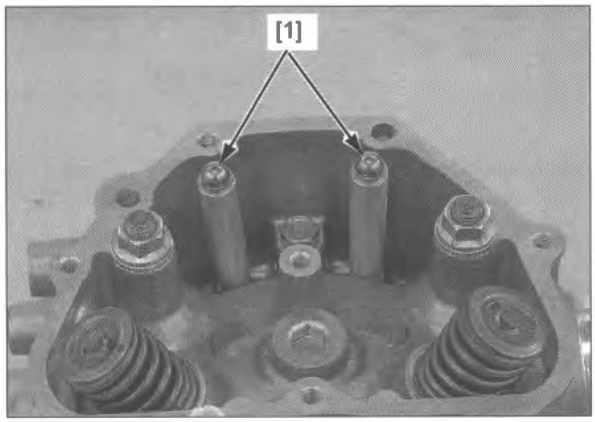


INSTALLATION

Clean the mating surfaces of the head cover and cylinder head, being careful not to damage them.

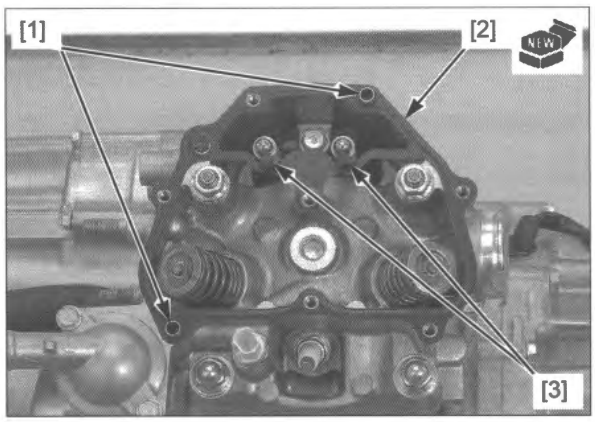
Install the push rods [1] onto the cam followers.

Make sure the piston is TDC (Top Dead Center) on the compression stroke by checking the push rod height.
If the exhaust side push rod height is high, rotate the crankshaft clockwise one full turn and align the "T" mark with the index mark again.



Install the two dowel pins [1] and a new gasket [2].

Rest the push rods onto the gasket grooves [3] as shown.

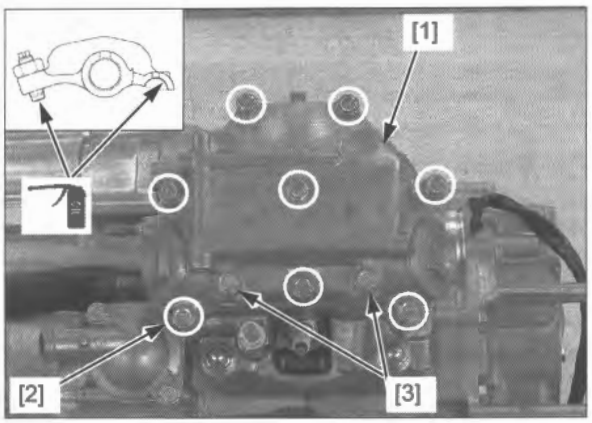


Apply engine oil to the rocker arm followers and adjusting screw tips, and install the cylinder head cover [1].
Make sure there is no clearance at the mating surface of the cylinder head and cover.

Install the eight bolts [2] and tighten them in a crisscross pattern in several steps.

Tighten the rocker arm shaft retaining bolts [3] securely.

Adjust the valve clearance (page 3-8).

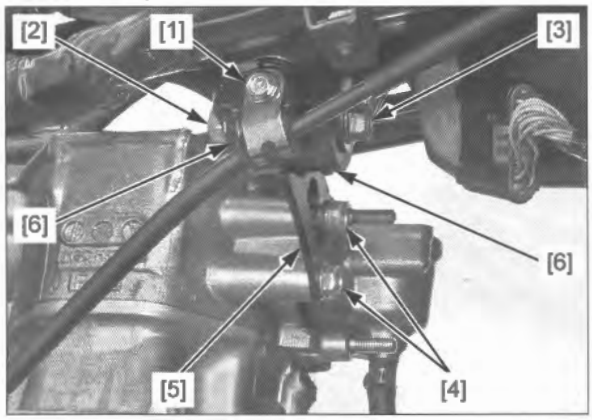


CYLINDER HEAD

REMOVAL

Remove the following:

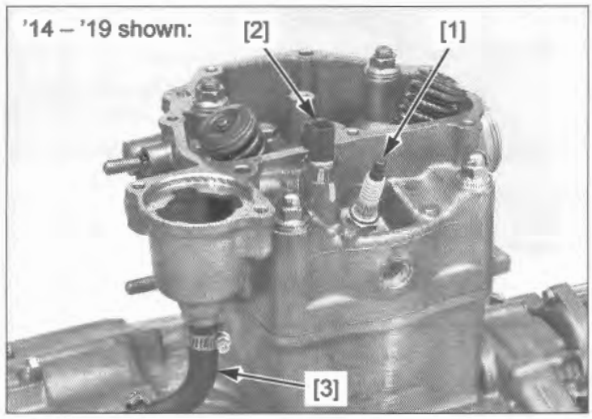
- cylinder head cover (page 10-6)
- throttle body (page 7-19)
- exhaust system (page 2-16)
- thermostat (page 8-6)
- bolt [1]
- upper engine hanger nut [2] and bolt [3] (frame side)
- upper engine hanger bolts (engine side) [4]
- engine hanger bracket [5] and mounting rubbers [6]



Remove the following:

- spark plug [1]
- ECT sensor [2]

Disconnect the water hose [3] from the cylinder head.

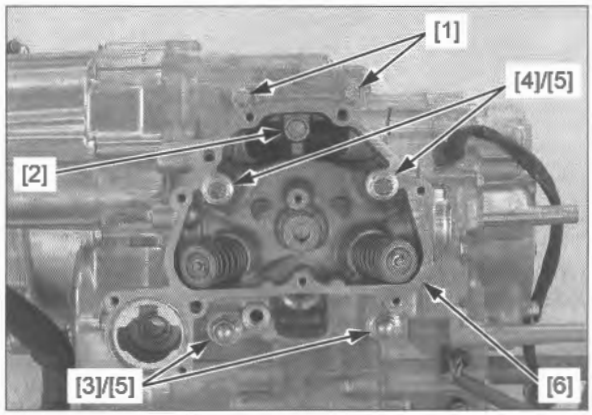


Loosen the two cylinder bolts [1].

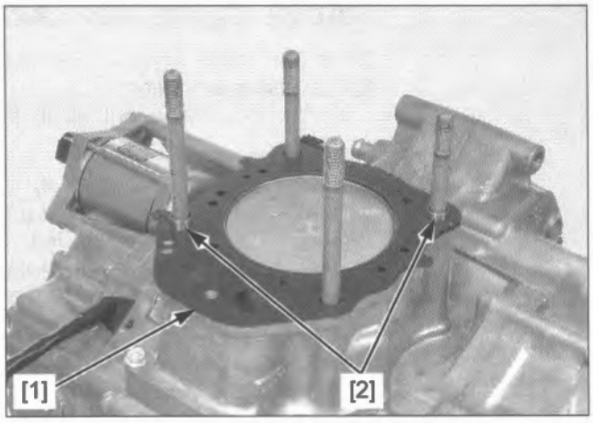
Be careful not to let the nuts and washers fall into the crankcase.

Loosen the cylinder head bolt [2], cap nuts [3] and flange nuts [4] in a crisscross pattern in several steps, and remove the bolt, nuts and washers [5].

Remove the cylinder head [6], being careful not to damage the mating surfaces.



Remove the gasket [1] and two dowel pins [2].



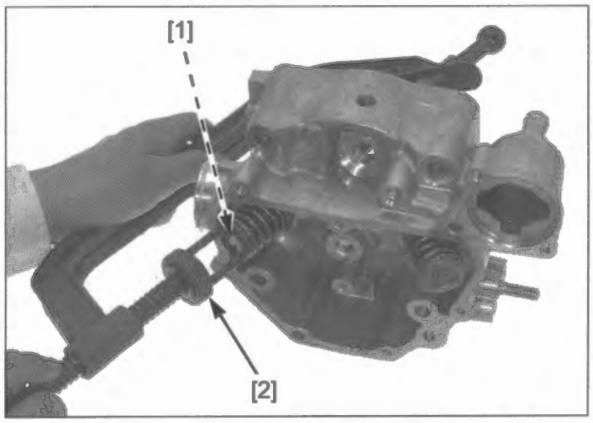
DISASSEMBLY

Remove the cylinder head (page 10-10).

To prevent loss of tension, do not compress the valve springs more than necessary.

Remove the valve spring cotters [1] using the valve spring compressor [2].

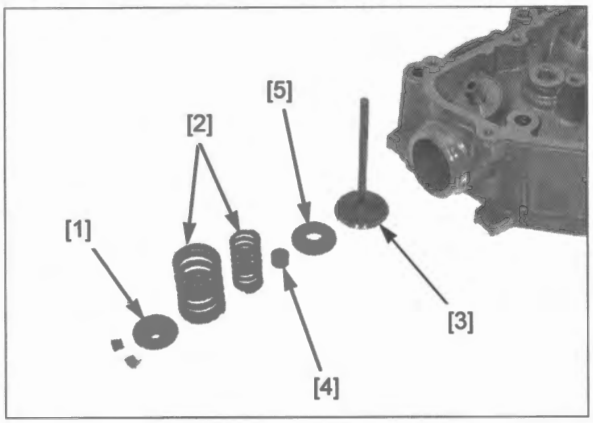
TOOL:
Valve Spring Compressor Set 07757-0010000



Mark all the parts so they can be placed back in their original locations.

Remove the following:

- spring retainer [1]
- outer and inner valve springs [2]
- valve [3]
- stem seal [4]
- spring seat [5]



INSPECTION

Inspect the following parts for damage, abnormal wear, deformation, burning or clogs in oil passages.

- Cylinder head
- Inner/outer valve springs
- Valves
- Valve guides

Measure each part according to CYLINDER HEAD/ VALVE SPECIFICATIONS (page 1-12).

Replace any part if it is out of service limit.

VALVE GUIDE REPLACEMENT

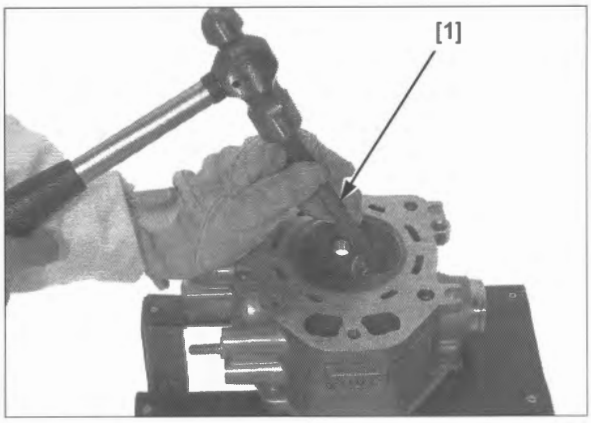
Mark new valve guide at the specified height indicated below, using a marker.
Chill the new valve guides in a freezer for about an hour.

Be sure to wear heavy gloves to avoid burns when handling the heated cylinder head. Using a torch to heat the cylinder head may cause warpage.

Heat the cylinder head to 130 – 140°C (275 – 290°F) with a hot plate or oven. Do not heat the cylinder head beyond 150°C (300°F). Use temperature indicator sticks, available from welding supply stores, to be sure the cylinder head is heated to the proper temperature.

Support the cylinder head and drive the valve guides out of the cylinder head from the combustion chamber side.

TOOL:
[1] Valve Guide Driver 6.0 x 11.5 07942-6570100

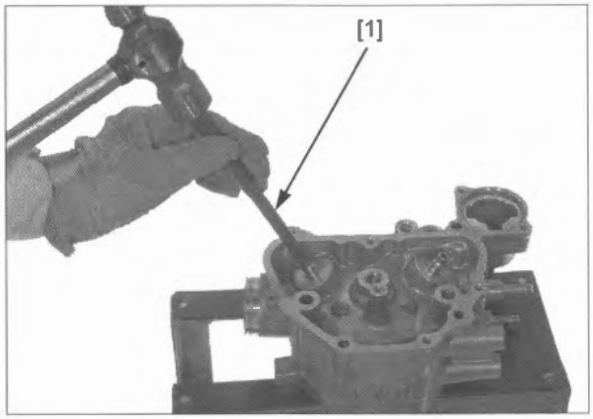


Remove the new valve guides from the freezer.
While the cylinder head is still heated, drive each valve guide in the cylinder head from the rocker arm side until the exposed height is at the specified value (at the mark).

TOOL:
[1] Valve Guide Driver 6.0 x 11.5 07942-6570100

VALVE GUIDE PROJECTION:
IN/EX: 14.8 – 15.0 mm (0.58 – 0.59 in)

Let the cylinder head cool to room temperature.

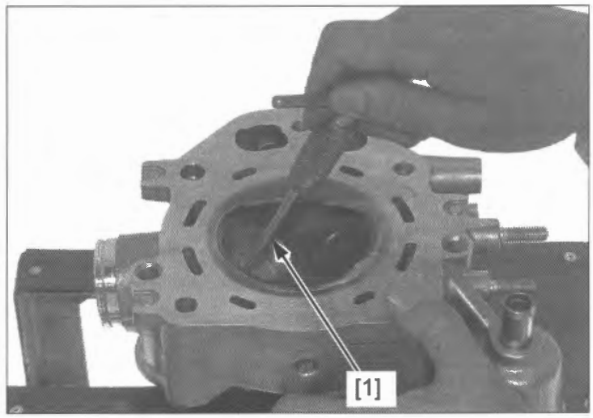


Use cutting oil on the reamer during this operation. Take care not to tilt or lean the reamer in the guide while reaming.

Ream the new valve guides.
Insert the reamer from the combustion chamber side of the cylinder head and always rotate the reamer clockwise.

TOOL:
[1] Valve Guide Reamer 6.012 07VMH-MBB0200 or 07VMH-MBB020A (U.S.A. only)

Clean the cylinder head thoroughly to remove any metal particles after reaming and reface the valve seat (page 10-12).

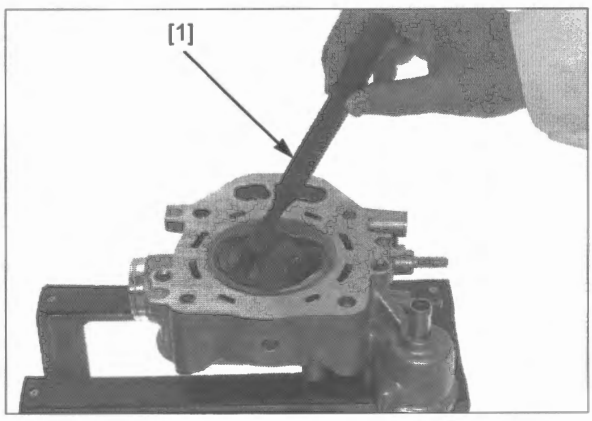


VALVE SEAT INSPECTION/REFACING

INSPECTION

Clean all intake and exhaust valves thoroughly to remove carbon deposits.

Apply a light coating of Prussian Blue to each valve seat.
Tap the valve against the valve seat several times using the hand-lapping tool [1] without rotating the valve, to check for proper valve seat contact.



REFACING

Reface the valve seat using the following tools.

TOOLS:

Cutter Holder 6.0	**07VMH-MBB0100**
Seat Cutter 40 mm (45° IN)	**07780-0010500**
Seat Cutter 33 mm (45° EX)	**07780-0010800**
Flat Cutter 38.5 mm (32° IN)	**07780-0012400**
Flat Cutter 33 mm (32° EX)	**07780-0012900**
Interior Cutter 37.5 mm (60° IN)	**07780-0014100**
Interior Cutter 34 mm (60° EX)	**07780-0014700**

or equivalent commercially available in U.S.A.

VALVE SEAT WIDTH: 1.2 mm (0.05 in)

NOTE:

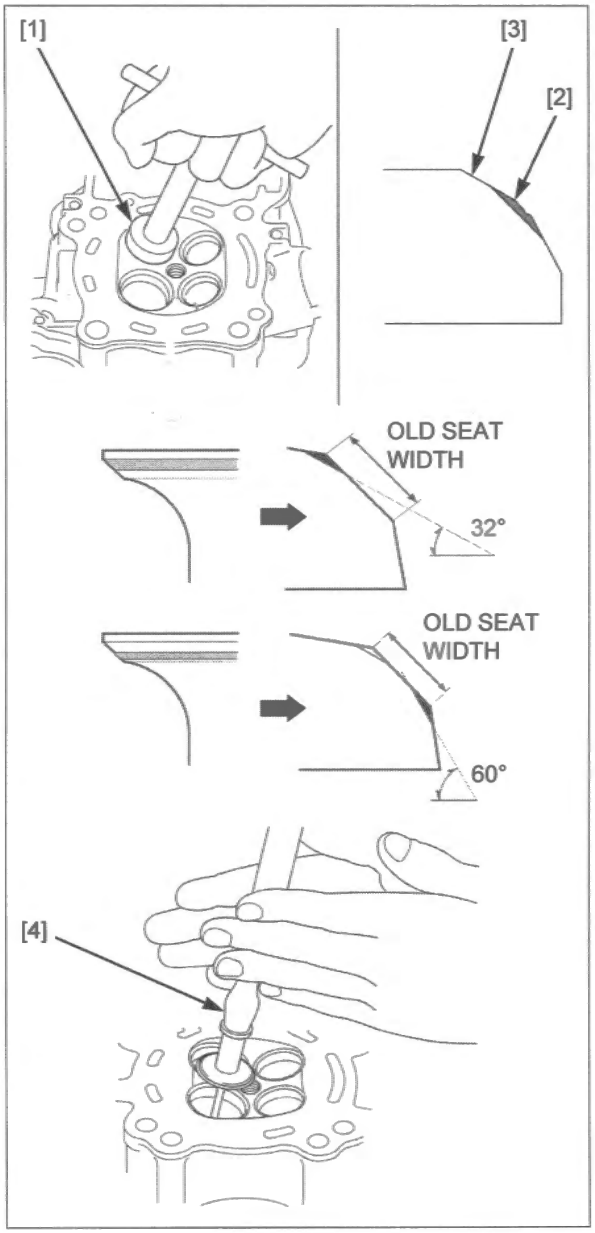
- Follow the refacer manufacturer's operating instructions.
- Be careful not to grind the seat more than necessary.

1. Use a 45° seat cutter [1], remove any roughness or irregularities [2] from the seat [3].
2. Use a 32° flat cutter, remove the top 1/4 of the existing valve seat material.
3. Use a 60° interior cutter, remove the bottom 1/4 of the existing valve seat material.
4. Using a 45° seat cutter, cut the seat to the proper width.
5. After cutting the seat, apply lapping compound to the valve face, and lap the valve using light pressure.

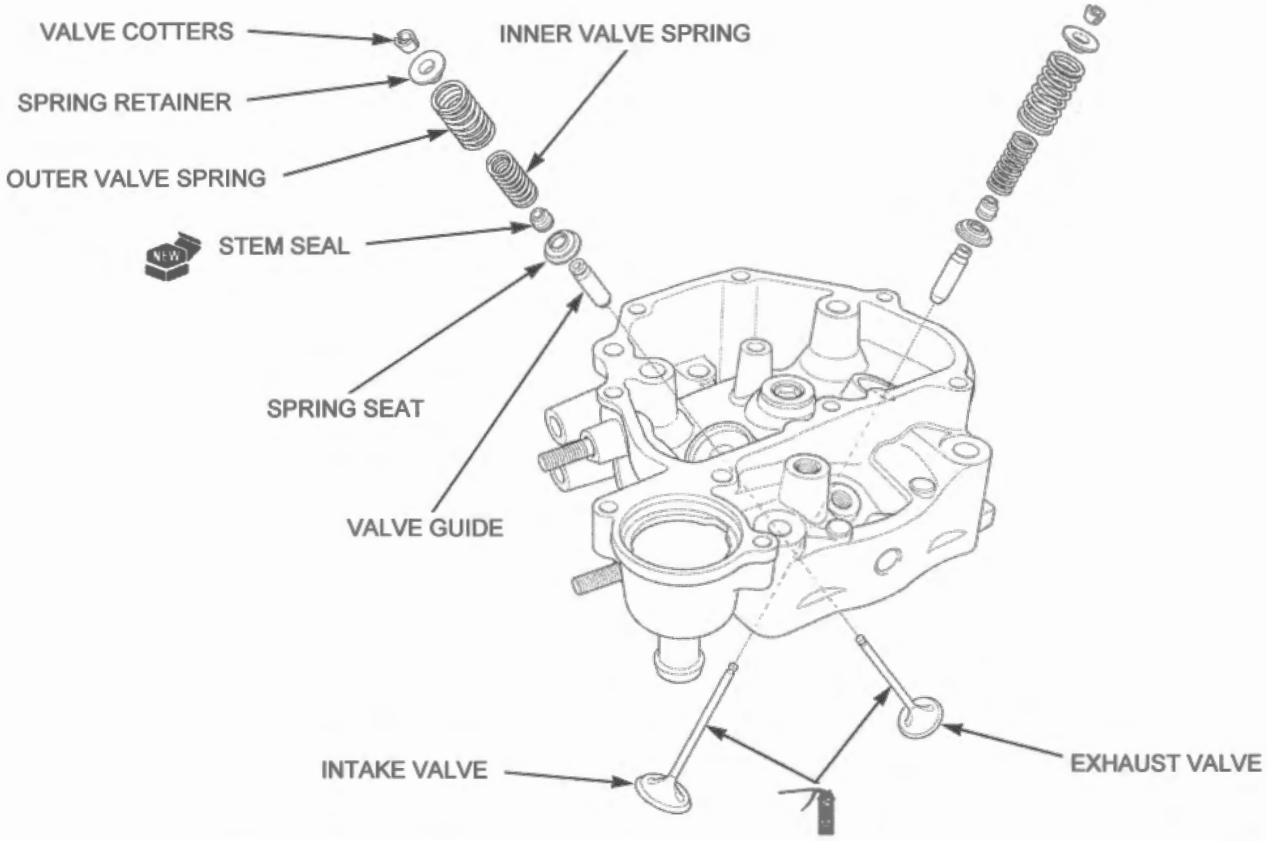
NOTE:

- Excessive lapping pressure may deform or damage the seat.
- Change the angle of hand lapping tool [4] frequently to prevent uneven seat wear.
- Do not allow lapping compound to enter the guides.

After lapping, wash any residual compound off the cylinder head and valve and recheck the seat contact.



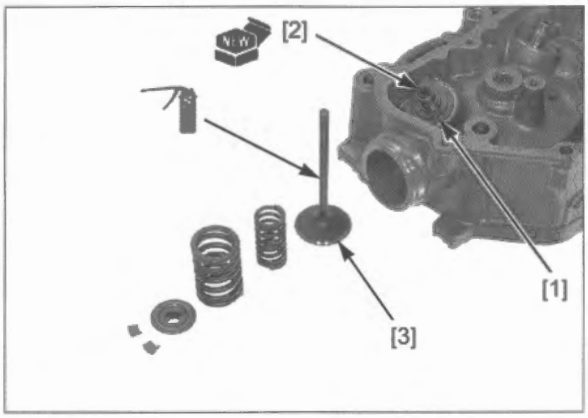
ASSEMBLY



Blow through the oil passage in the cylinder head with compressed air.

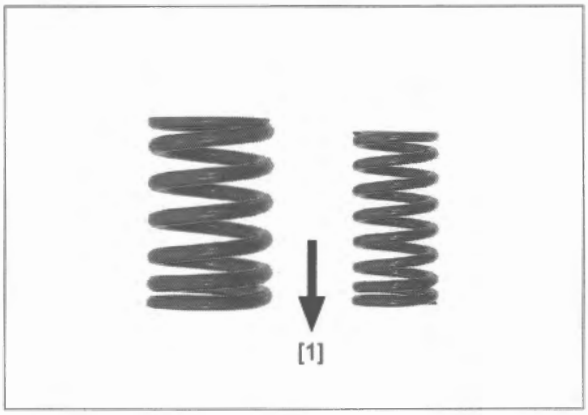
Install the spring seats [1] and new stem seals [2].

Lubricate the valve [3] stem sliding surface with molybdenum oil solution.
Insert the valve into the guide while turning it slowly to avoid damaging the stem seal.



Install the inner and outer valve springs with the tightly wound coils facing the combustion chamber.

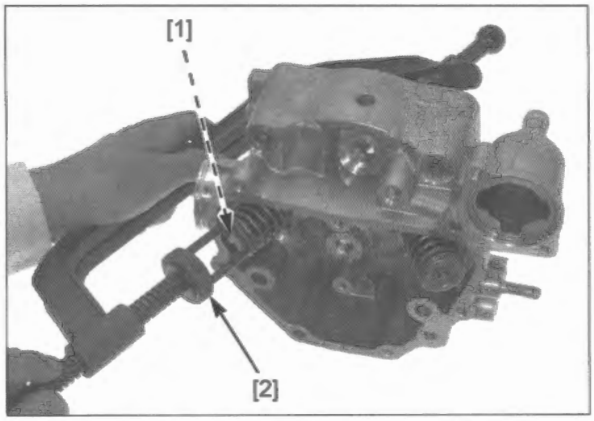
Install the spring retainer [1].



Grease the cotters to ease installation. To prevent loss of tension, do not compress the valve springs more than necessary.

Install the valve spring cotters [1] using the valve spring compressor [2].

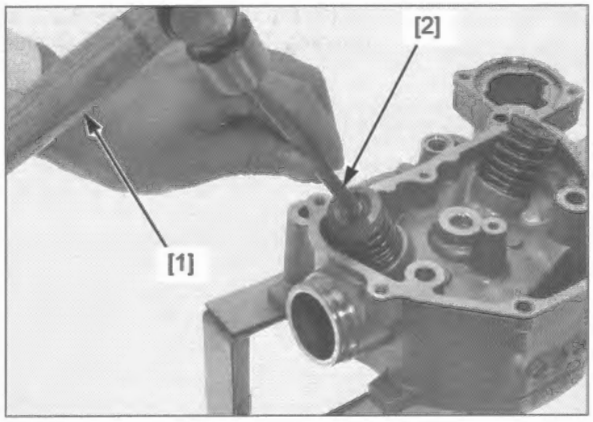
TOOL:
Valve Spring Compressor Set 07757-0010000



Support the cylinder head so the valve heads will not contact anything that could cause damage.

Tap the valve stems gently with a hammer [1] and a shaft [2] as shown to seat the cotters firmly.

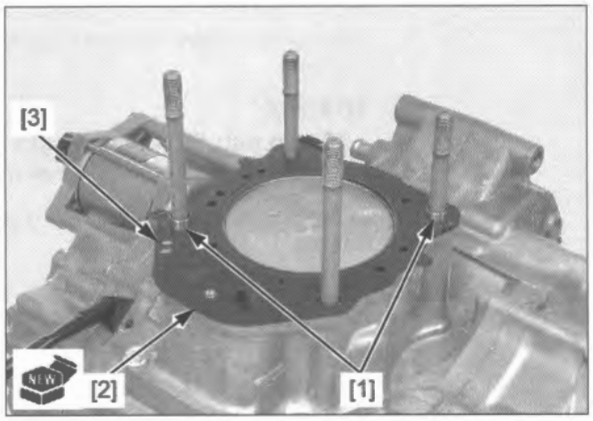
Install the cylinder head (page 10-15).



INSTALLATION

Clean the mating surfaces of the cylinder and cylinder head, being careful not to damage them.

Install the two dowel pins [1] and a new gasket [2] with the mark [3] facing up.



Install the cylinder head [1] on the cylinder.

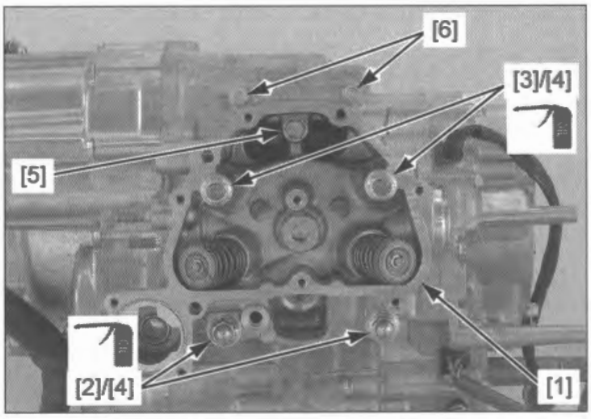
Be careful not to let the nuts and washers fall into the crankcase.

Apply engine oil to the threads and seating surface of the cap nuts [2] and flange nuts [3].
Install the washers [4], nuts and cylinder head bolt [5].
Tighten the nuts to the specified torque in a crisscross pattern in several steps.

TORQUE: 48 N·m (4.9 kgf·m, 35 lbf·ft)

Tighten the cylinder head bolt securely.

Tighten the cylinder bolts [6] alternately in several steps.

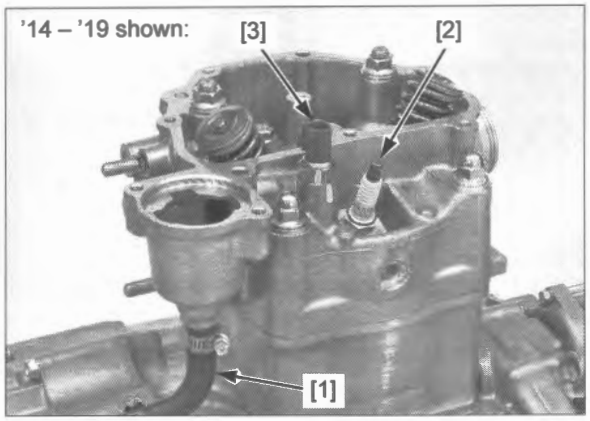


Connect the water hose [1] to the cylinder head.

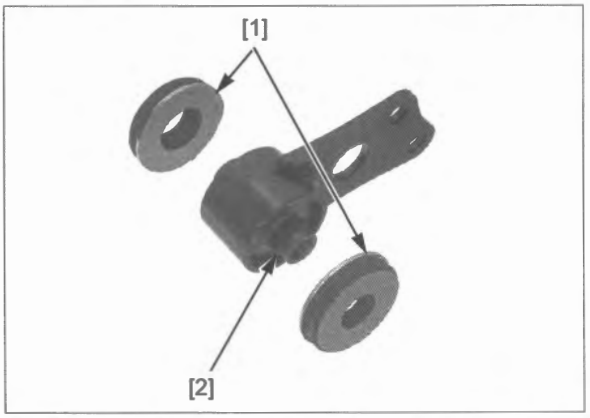
- Tighten the hose clamp screw securely (page 8-8).

Install the following:

– spark plug [2] (page 3-7)
– ECT sensor [3] (page 4-43)



Install the mounting rubbers [1] onto the hanger bracket bushing [2] with the large I.D. side facing in.



Insert the 10 mm (frame side) bolt from the front side.

Install the engine hanger bracket [1] with the 8 mm bolts [2], 10-mm bolt [3] and nut [4].

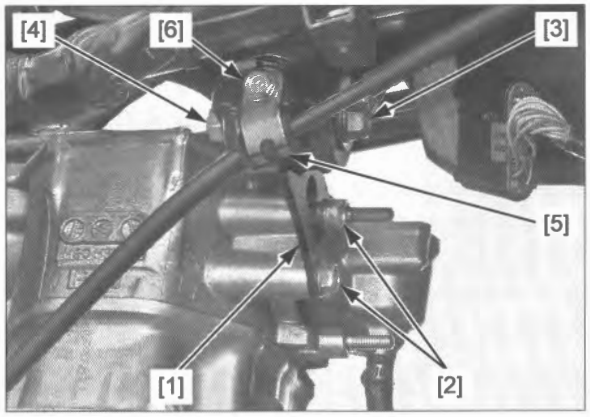
Tighten the engine hanger bolts and nut to the specified torque.

TORQUE:
10 mm nut: 63 N·m (6.4 kgf·m, 46 lbf·ft)
8 mm bolt: 32 N·m (3.3 kgf·m, 24 lbf·ft)

Install the reverse lock cable guide [5] and tighten the bolt [6]

Install the following:

– cylinder head cover (page 10-9)
– throttle body (page 7-21)
– exhaust system (page 2-16)
– thermostat (page 8-6)



CAMSHAFT

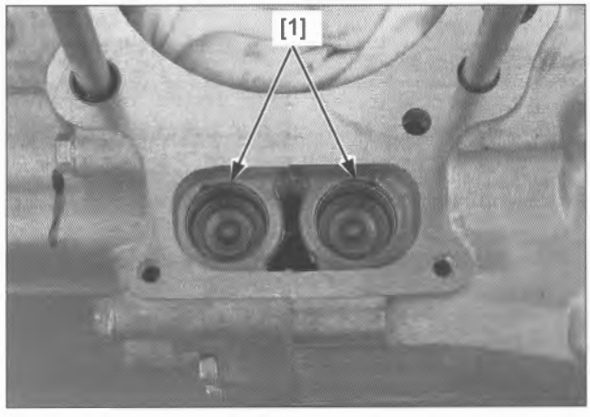
REMOVAL

Remove the following:

– cylinder (page 11-4)
– primary drive gear (page 12-14)

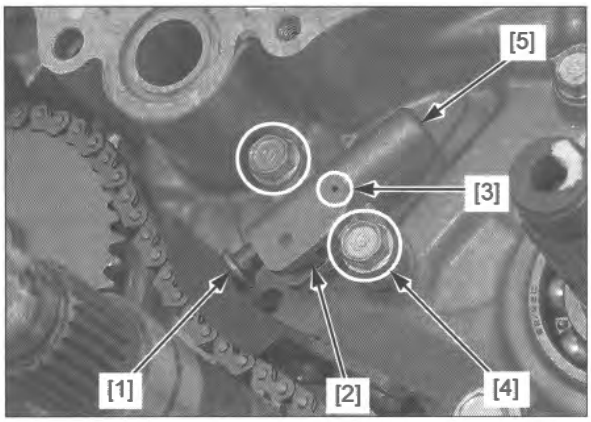
Mark the followers so they can be placed back in their original locations.

Remove the cam followers [1] from the crankcase.



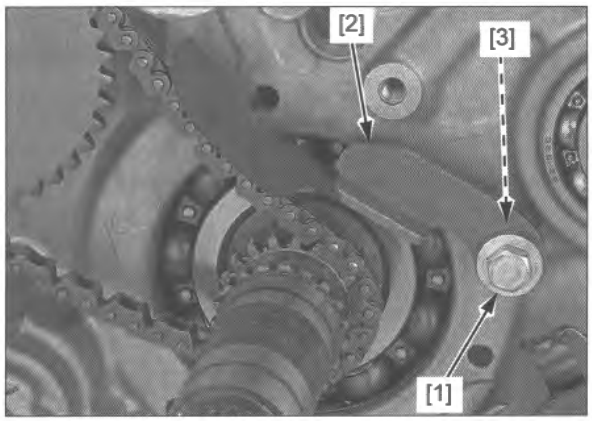
Push in the tensioner lifter shaft [1] while pressing the ratchet pawl [2] and insert a pin into the hole [3] to hold the tensioner lifter shaft.

Remove the two bolts [4] and cam chain tensioner lifter [5].



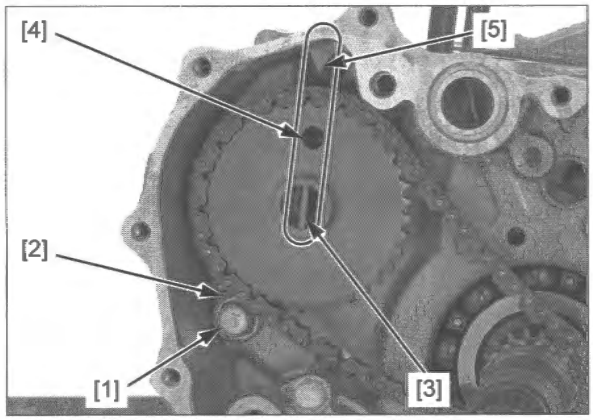
Remove the following:

- tensioner pivot bolt [1]
- cam chain tensioner [2]
- washer [3]

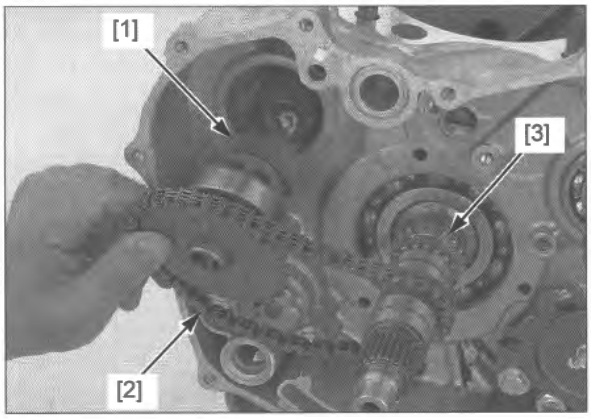


Remove the bolt [1] and bearing setting plate [2].

- Make sure the camshaft pin [3] and cam sprocket hole [4] is lined up with the index mark (▽) [5] on the crankcase.

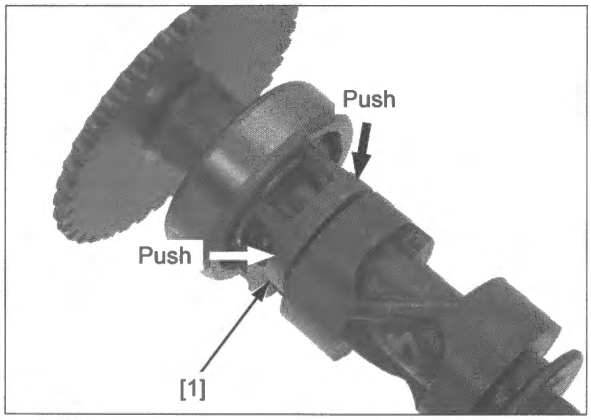


Remove the bearing of the camshaft [1] from the crankcase, derail the cam chain [2] from the timing sprocket [3] of the crankshaft, and remove the camshaft and cam chain.



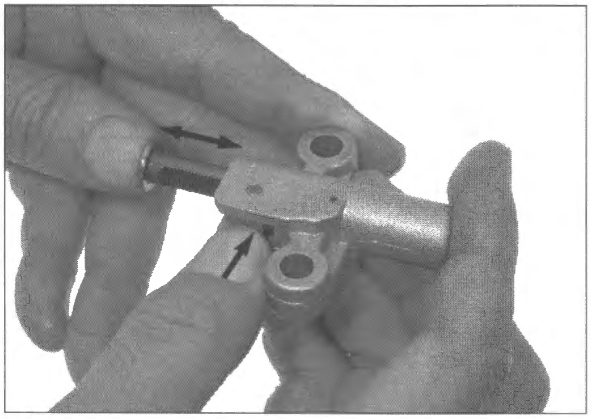
INSPECTION

Check the decompressor cam [1] operation.
Press on the decompressor cam as shown.
As you press on one side, the decompressor cam should lock above the base circle of the exhaust cam lobe.
As you press on other side, the decompressor lobe will drop below the base circle of the exhaust cam lobe.



Check the tensioner lifter operation:

- The tensioner lifter shaft should not go into the body when it is pushed.
- When the ratchet pawl is pressed in, the tensioner shaft should be pushed into the lifter body.



Inspect the following parts for damage, abnormal wear, deformation, burning or clogs in oil passages.

- Camshaft
- Camshaft bearing
- Cam sprocket
- Cam chain tensioner
- Cam follower

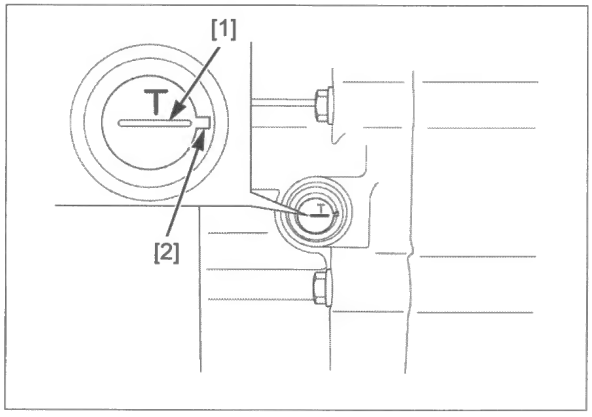
Measure each part according to CYLINDER HEAD/ VALVE SPECIFICATIONS (page 1-12).

Replace any part if it is out of service limit.

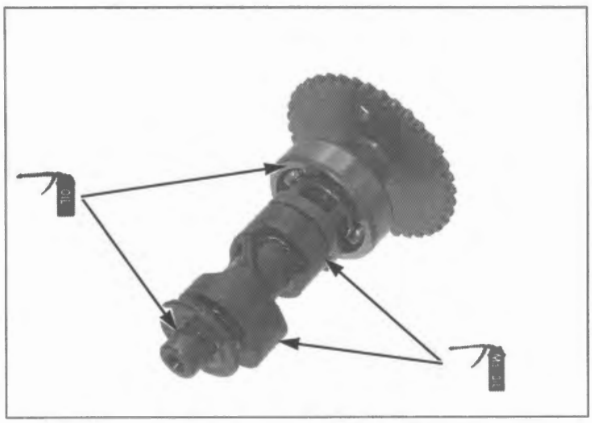
INSTALLATION

Cover the piston with a shop towel or equivalent to protect it from damage.

Rotate the crankshaft to align the "T" mark [1] on the flywheel with the index mark [2] on the rear crankcase cover.

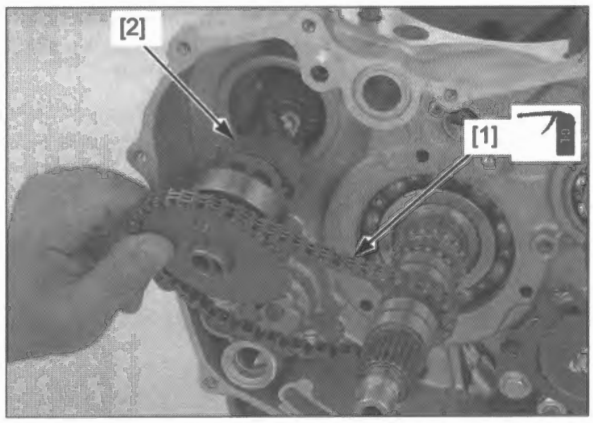


Lubricate the camshaft bearing and journal with engine oil.
Apply molybdenum oil solution to the cam lobes.



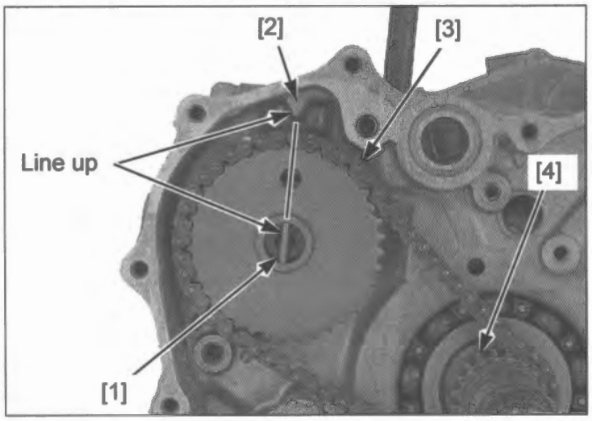
Lubricate the cam chain [1] whole surface with engine oil and install it on the cam sprocket.

Loosely install the camshaft [2] into the crankcase.

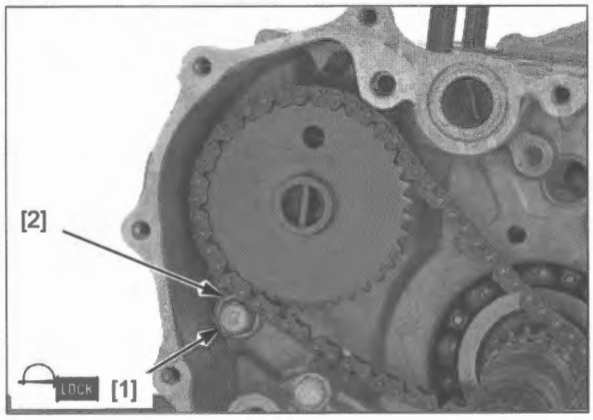


Do not turn the crankshaft during installation.

Line up the camshaft pin [1] and index mark (▽) [2] on the crankcase with the sprocket hole facing up and install the cam chain [3] over the timing sprocket [4] on the crankshaft.
Install the camshaft into the crankcase completely and make sure that the camshaft pin and index mark (▽) line up.

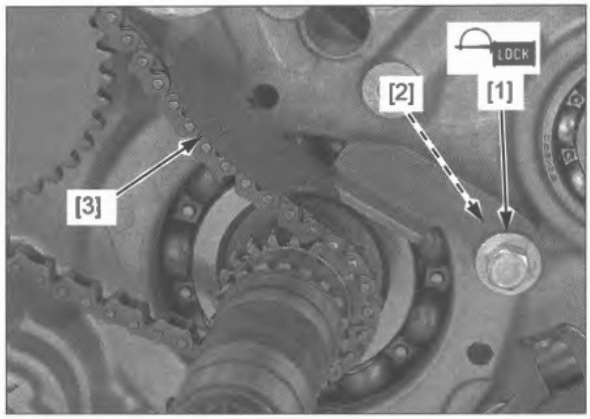


Apply locking agent to the threads of the setting plate bolt [1] (page 1-27).
Install the bearing setting plate [2] onto the crankcase and tighten the bolt securely.

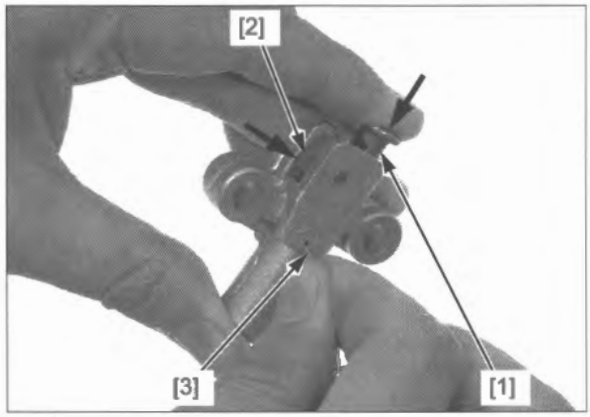


Apply locking agent to the threads of the tensioner pivot bolt [1] (page 1-17).
Install the washer [2] (in between the tensioner and crankcase), cam chain tensioner [3] and pivot bolt, and tighten the bolt to the specified torque.

TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)



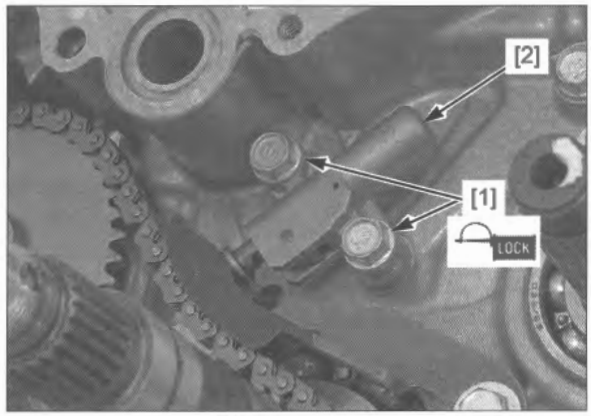
Push in the tensioner lifter shaft [1] while pressing the ratchet pawl [2] and insert a pin [3] into the hole to hold the tensioner lifter shaft.



Apply locking agent to the threads of the tensioner lifter bolts [1] (page 1-27).
Install the tensioner lifter [2] and tighten the bolts securely.

Remove the pin from the tensioner lifter.

Make sure that the camshaft pin and index mark (▽) line up when the "T" mark on the flywheel is aligned with the index mark on the crankcase cover.

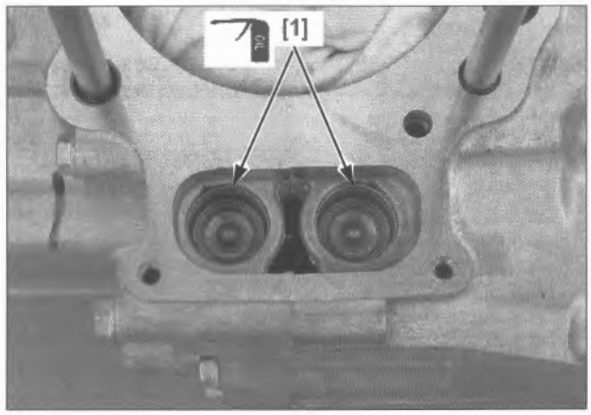


Be careful not to scratch the sliding surfaces of the followers and bores.

Apply engine oil to the whole surface of the cam followers [1] and install them into the crankcase with the opening facing up.

Install the following:

- change clutch (page 12-16)
- cylinder (page 11-7)



11. CYLINDER/PISTON

SERVICE INFORMATION 11-2

TROUBLESHOOTING 11-2

SYSTEM COMPONENTS 11-3

CYLINDER/PISTON 11-4

SERVICE INFORMATION

GENERAL

- The cylinder and piston can be serviced with the engine installed in the frame.
- Take care not to damage the cylinder wall and piston.
- Be careful not to damage the mating surfaces when removing the cylinder.
- Rocker arm and valve lubricating oil is fed through the oil passage in the cylinder. Clean the oil passage before installing the cylinder.

TROUBLESHOOTING

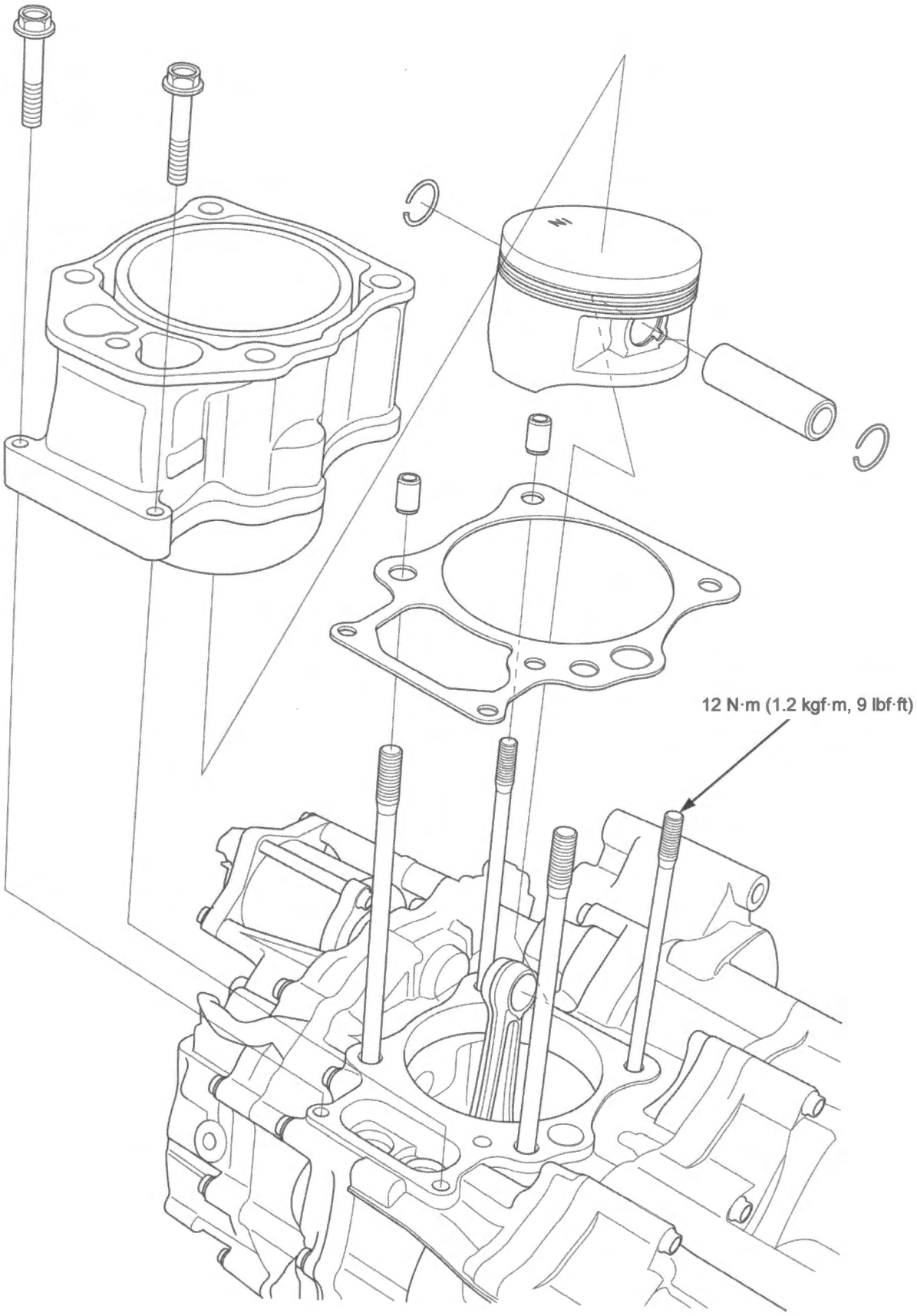
Compression too low, hard starting or poor performance at low speed
- Leaking cylinder head gasket
- Worn, stuck or broken piston ring
- Worn or damaged cylinder and piston

Compression too high, overheating or knocking
- Excessive carbon build-up on piston head or combustion chamber

Excessive smoke
- Worn cylinder, piston or piston rings
- Improper installation of piston rings
- Scored or scratched piston or cylinder wall

Abnormal noise
- Worn piston pin or piston pin hole
- Worn connecting rod small end
- Worn cylinder, piston or piston rings

SYSTEM COMPONENTS



CYLINDER/PISTON

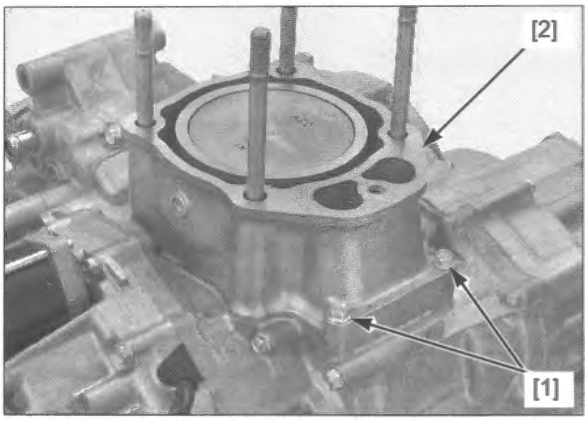
CYLINDER REMOVAL

Remove the cylinder head (page 10-10)

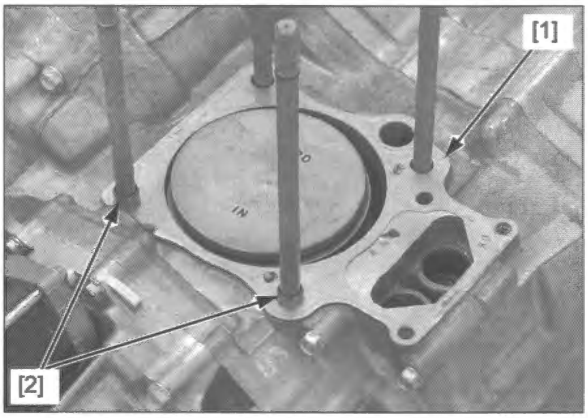
Remove the two bolts [1].

Do not use a screwdriver or other tool to pry the cylinder off as it could damage the mating surface.

Lift the cylinder [2] and remove it, being careful not to damage the piston and piston rings with the stud bolts.



Remove the gasket [1] and the two dowel pins [2].

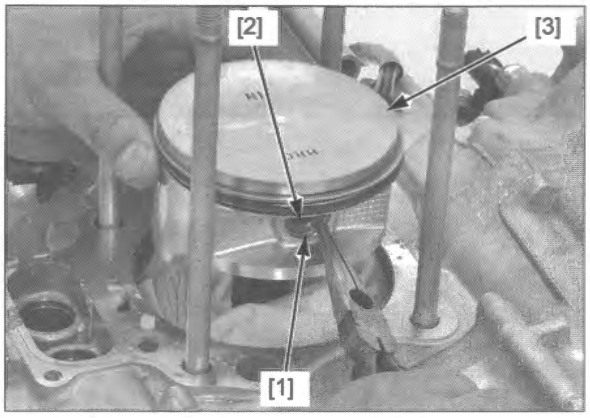


PISTON REMOVAL

Place a clean shop towel over the crankcase to prevent the piston pin clip from falling into the crankcase.

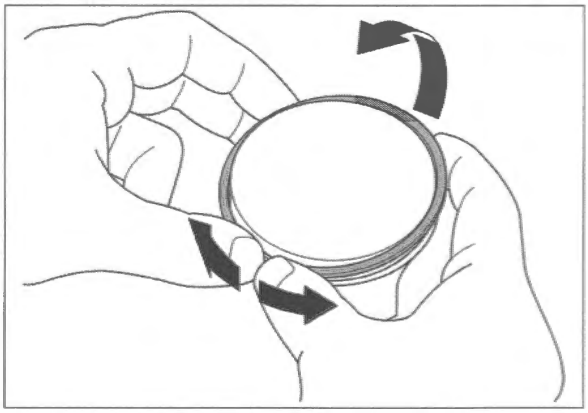
Remove the piston pin clips [1] with the pliers.

Push the piston pin [2] out of the piston and connecting rod, and remove the piston [3].



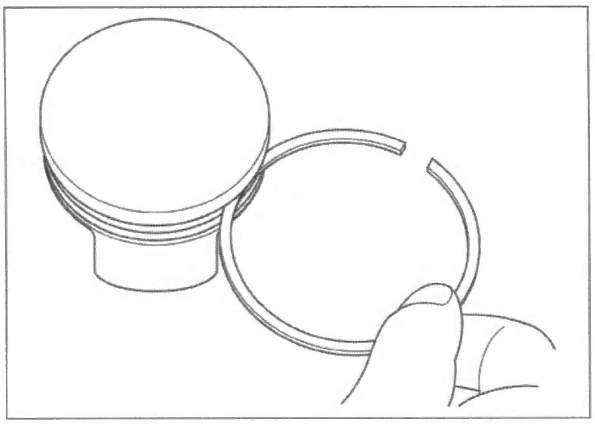
Do not damage the piston ring by spreading the ends too far.

Spread each piston ring and remove it by lifting up at a point opposite the gap.



Never use a wire brush; it will scratch the grooves.

Clean carbon deposits from the ring grooves with a ring that will be discarded.



INSPECTION

Inspect the following parts for scratches, damage, abnormal wear, deformation, burning or clogs in oil passages.

- cylinder
- piston
- piston rings
- piston pin
- connecting rod small end

Measure each part and calculate the clearance according to CYLINDER/PISTON SPECIFICATIONS (page 1-12).

Replace any part if it is out of service limit.

CYLINDER STUD BOLT REPLACEMENT

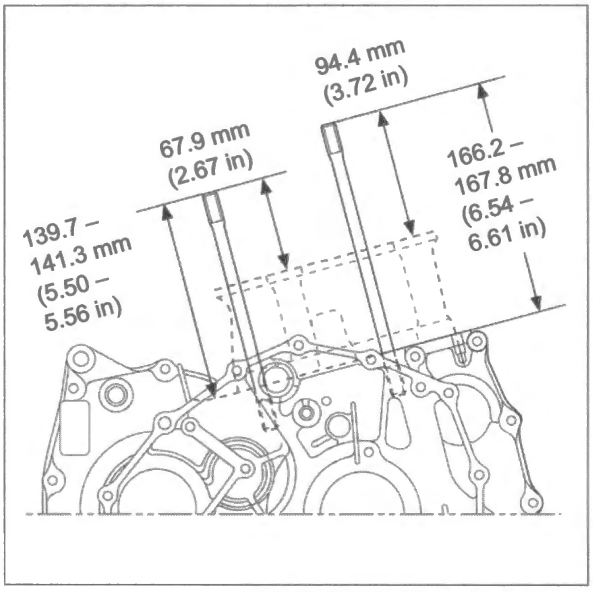
Thread two nuts onto the stud and tighten them together, and use a wrench on them to turn the stud bolt out.

Install new stud bolts and tighten them to the specified torque.

TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)

Be sure to verify the stud height from the cylinder mating surface of the crankcase.

Adjust the height if necessary.



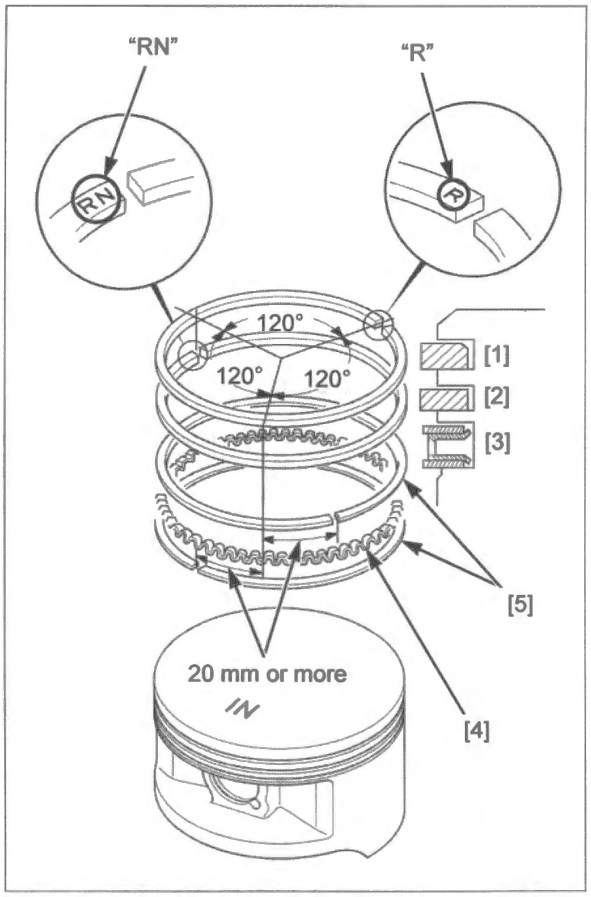
PISTON RING INSTALLATION

Carefully install the piston rings into the piston ring grooves with the markings facing up.

NOTE:

- Do not confuse the top ring [1] and second ring [2].
- To install the oil ring [3], install the spacer [4] first, then install the side rails [5].

Stagger the piston ring end gaps 120° degrees apart from each other.
Stagger the side rail end gaps as shown.



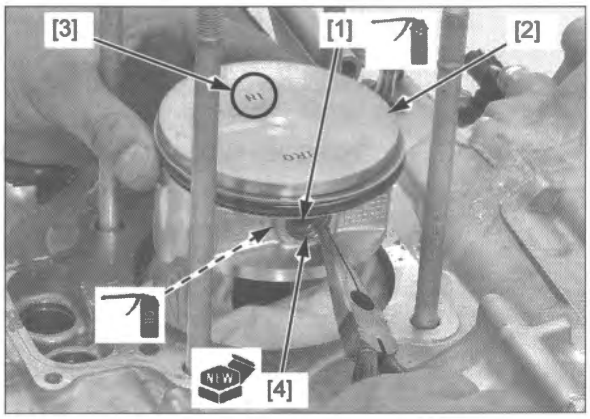
PISTON INSTALLATION

Place a clean shop towel over the crankcase to prevent the piston pin clip from falling into the crankcase.

Apply engine oil to the piston pin hole and connecting rod small end inner surface.
Apply molybdenum oil solution to the outer surface of the piston pin [1].

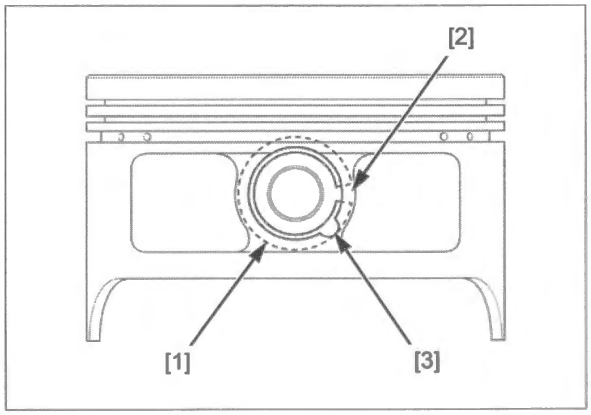
Install the piston [2] with the "IN" mark [3] toward the intake side and insert the piston pin through the piston and connecting rod.

Install new piston pin clips [4] into the grooves in the piston pin hole.



NOTE:

- Make sure that the piston pin clips [1] are seated securely.
- Do not align the piston pin clip end gap [2] with the piston cutout [3].

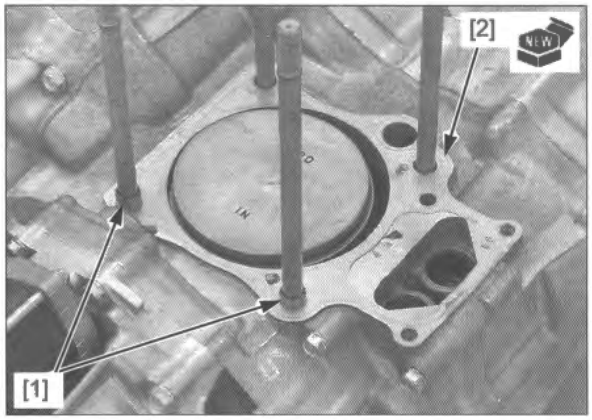


CYLINDER INSTALLATION

Clean the mating surfaces of the cylinder and crankcase thoroughly, being careful not to damage them, and being careful not to allow gasket material to enter the crankcase.

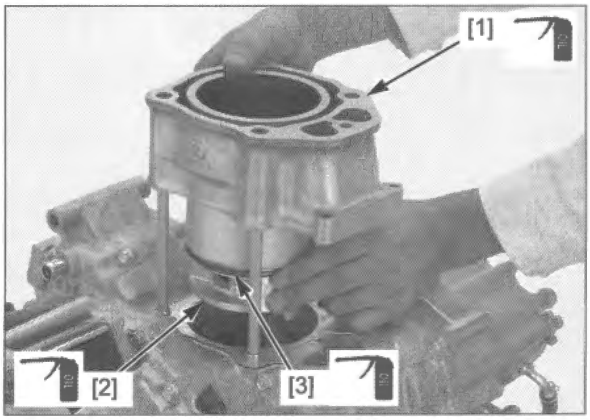
Blow through the oil passage in the cylinder with compressed air.

Install the two dowel pins [1] and a new gasket [2].



Apply engine oil to the cylinder [1] bore, piston [2] outer surface and piston rings [3].

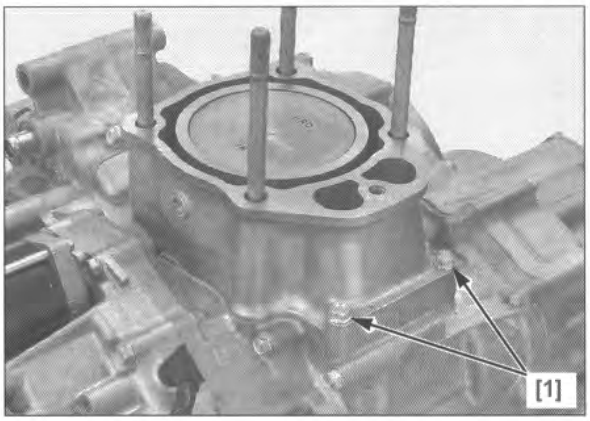
Install the cylinder over the piston while compressing the piston rings with your fingers.



Make sure that the cylinder touches the crankcase evenly.

Install the two bolts [1].

Install the cylinder head (page 10-9).



MEMO

12. CLUTCH/GEARSHIFT LINKAGE (FM/FE models)

SERVICE INFORMATION 12-2

TROUBLESHOOTING 12-3

SYSTEM COMPONENTS 12-4

FRONT CRANKCASE COVER 12-5

CENTRIFUGAL CLUTCH 12-8

CHANGE CLUTCH 12-14

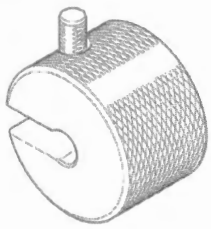
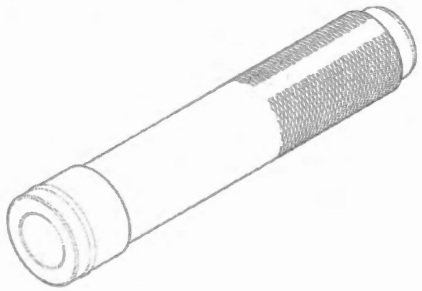
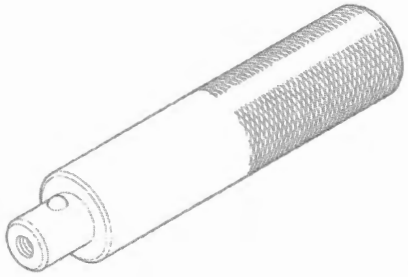
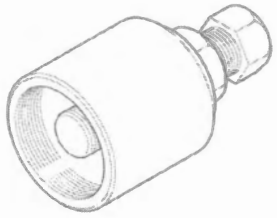
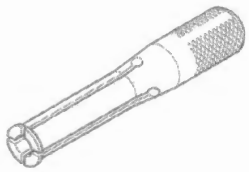
GEARSHIFT LINKAGE 12-18

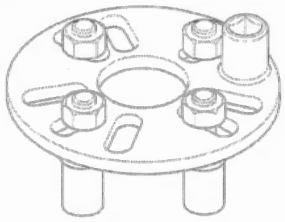
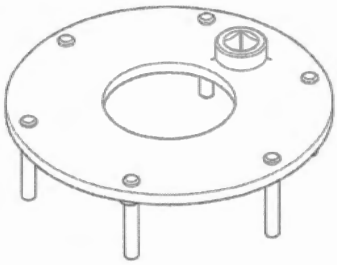
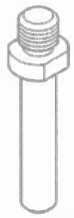
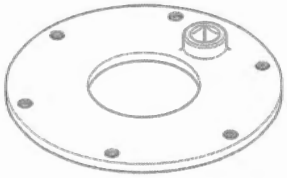
SERVICE INFORMATION

GENERAL

- This section covers service of the clutch (centrifugal clutch and change clutch) and gearshift linkage. To service the gearshift spindles of the FM models and reverse stopper shaft, the engine must be removed from the frame.
- The crankcase must be separated when the transmission, shift drum and shift forks require service (page 16-5).
- Engine oil viscosity and level and the use of oil additives have an effect on clutch operation. Oil additives of any kind are specifically not recommended. When the clutch does not disengage or the vehicle creeps, inspect the engine oil and oil level before servicing the clutch system.
- Engine lubricating oil is fed through the oil passages in the front crankcase cover. Clean the oil passages before installing the crankcase cover.
- The FE models are equipped with the electric shift program (ESP). For ESP service (page 25-33).

TOOLS

Remover Weight 07741-0010201  or 07936-371020A (U.S.A. only)	Attachment, 32 x 35 mm 07746-0010100 	Driver, 22 mm I.D. 07746-0020100 
Pilot, 15 mm 07746-0040300 	Driver 07749-0010000 	Inside Screw Puller 35 x 1.0 07933-HA80000  or 07933-HB3000A (U.S.A. only)
Remover Shaft, 15mm 07936-KC10100  Not available in U.S.A.	Remover Head, 15 mm 07936-KC10200  Not available in U.S.A.	Bearing remover, 15 mm 07936-KC10500 (U.S.A. only) 

Holder Clutch Center 07JMB-MN50302  or 07HGB-001010B or 07HGB-001010A and 07HGB-001020B or 07HGB-001020A (U.S.A. only)	Set Clutch Holder 07ZMB-HN20001  or 07ZMB-HN2A101 (U.S.A. only)	Pin Clutch Holder 07ZMB-HN20200  with Plate Clutch Holder 07ZMB-HN20101 Not available in U.S.A.
Plate Clutch Holder 07ZMB-HN20101  Not available in U.S.A.		

TROUBLESHOOTING

Clutch slips when accelerating
- Incorrect clutch adjustment (page 3-29)
- Worn clutch discs
- Weak clutch springs
- Faulty clutch lifter
- Improper oil viscosity or oil additive used

Clutch will not disengage
- Faulty clutch lifter
- Warped clutch plates

The vehicle creeps
- Faulty centrifugal clutch

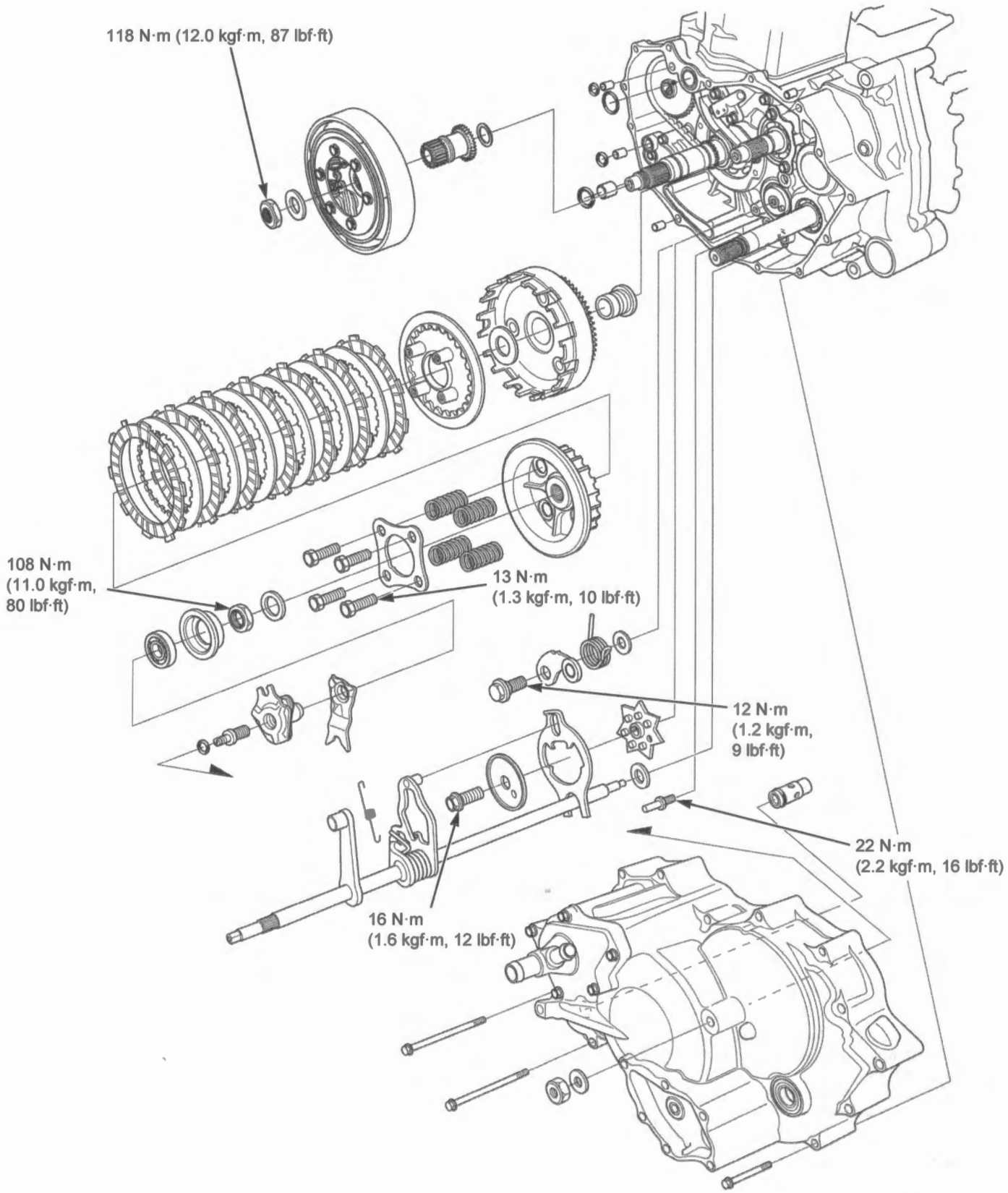
Clutch operating feels rough
- Worn clutch outer and center grooves
- Warped clutch plates
- Loose clutch lock nut
- Faulty clutch lifter
- Improper oil viscosity or oil level

Hard to shift
- Incorrect clutch adjustment (page 3-29)
- Worn or damaged gearshift linkage components
- Faulty clutch lifter
- Improper engine oil viscosity
- Faulty gearshift spindle
- Faulty shift forks/shaft or shift drum (page 16-4)

Transmission jumps out of gear
- Broken shift drum stopper arm
- Weak or broken shift linkage return springs
- Worn or damaged gearshift cam
- Faulty gearshift spindle
- Faulty shift forks/shaft or shift drum (page 16-4)
- Faulty transmission gears (page 16-4)

SYSTEM COMPONENTS

FE models shown:



FRONT CRANKCASE COVER

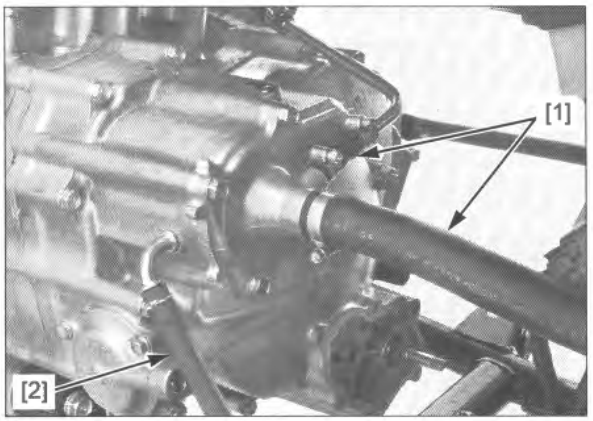
REMOVAL

Drain the engine oil (page 3-14).
Drain the coolant (page 8-5).

Remove the following:

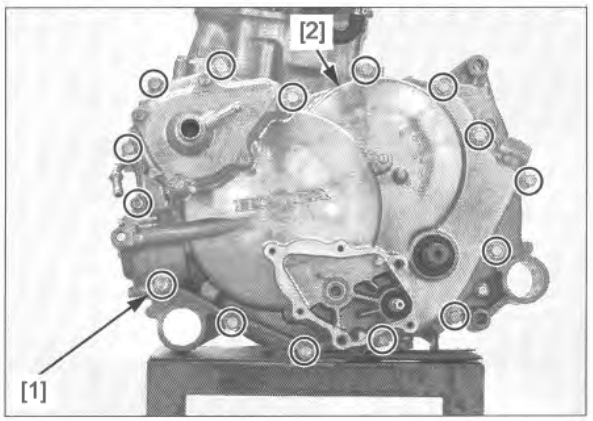
- engine guard (page 2-8)
- center mudguards (page 2-5)
- front propeller shaft (without removing the left drive shaft)(page 21-32)
- FE models: shift control motor and reduction gears (page 25-33)

Disconnect the water hoses [1] and bleed hose [2] from the front crankcase cover.

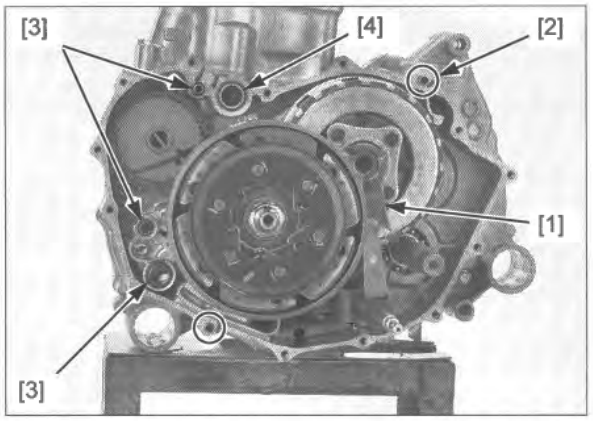


Remove the following:

- fifteen bolts [1]
- front crankcase cover [2]

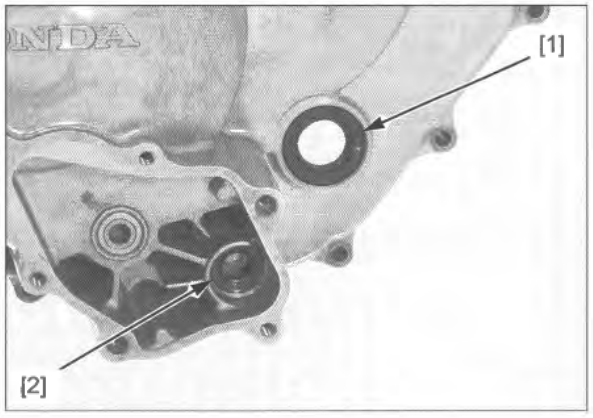


- lifter cam plate [1]
- two dowel pins [2]
- joint collars and O-rings [3]
- O-ring [4]



Remove the output shaft oil seal [1].

FE models: Remove the gearshift spindle oil seal [2].



CRANKSHAFT BEARING REPLACEMENT

Check the crankshaft bearing [1].
If the inner race does not turn smoothly, quietly, or if the outer race fits loosely in the cover, replace the bearing as follows:

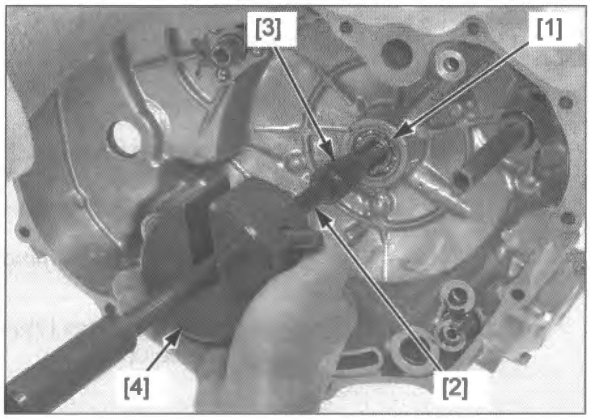
Remove the crankshaft bearing with the special tools.

TOOLS:

[2] Remover Shaft, 15 mm	**07936-KC10100**
[3] Remover Head, 15 mm	**07936-KC10200**
[4] Remover Weight	**07741-0010201**

U.S.A. TOOLS:

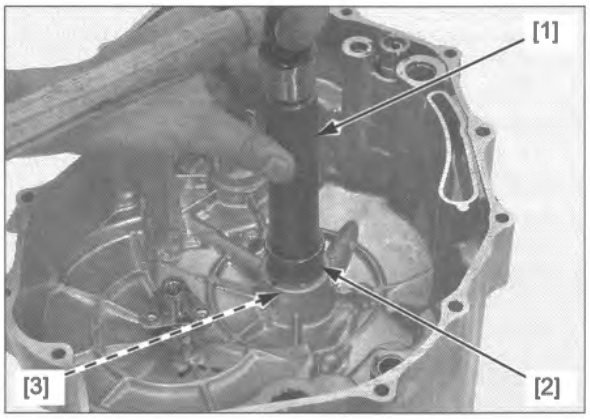
Bearing remover, 15 mm	**07936-KC10500**
Remover weight	**07936-371020A**



Apply engine oil to a new bearing.
Drive a new bearing squarely with the sealed side facing down until it is fully seated.

TOOLS:

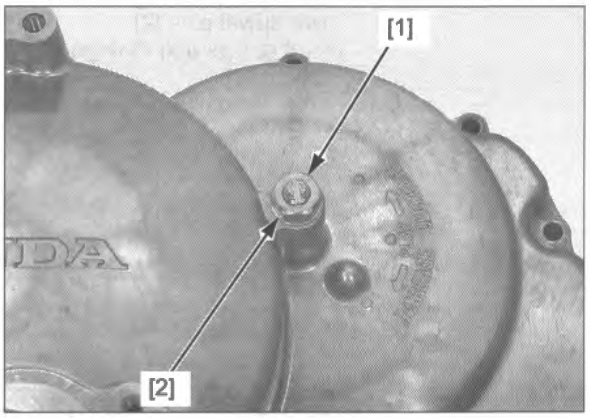
[1] Driver	**07749-0010000**
[2] Attachment, 32 x 35 mm	**07746-0010100**
[2] Pilot, 15 mm	**07746-0040300**



CLUTCH LIFTER

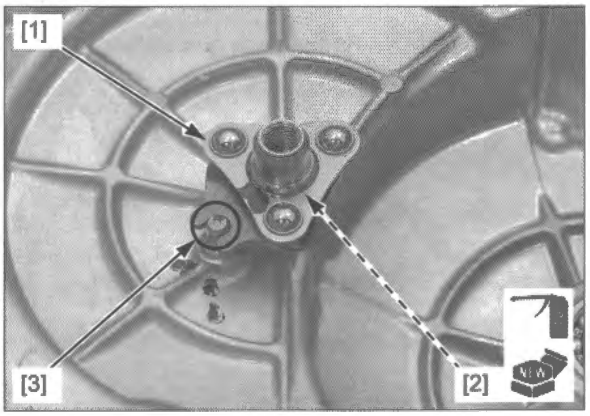
Check the clutch lifter plate assembly and cam plate for wear or damage, replace them if necessary.

Remove the lock nut [1] and washer [2].



Remove the adjusting bolt/lifter plate assembly [1] and O-ring [2].
Remove the adjusting bolt from the lifter plate assembly.

Install the adjusting bolt into the lifter plate assembly.
Coat a new O-ring with engine oil and install it onto the adjusting bolt.
Install the adjusting bolt/lifter plate assembly by aligning the groove with the stopper pin [3].
Temporarily install the washer and lock nut.

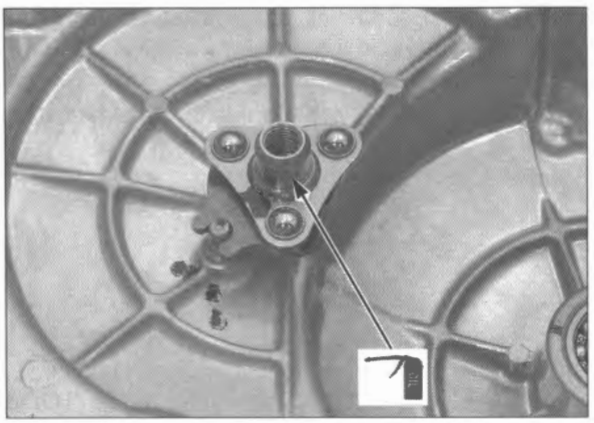


INSTALLATION

Clean the mating surfaces of the front crankcase cover and crankcase thoroughly, being careful not to damage them.

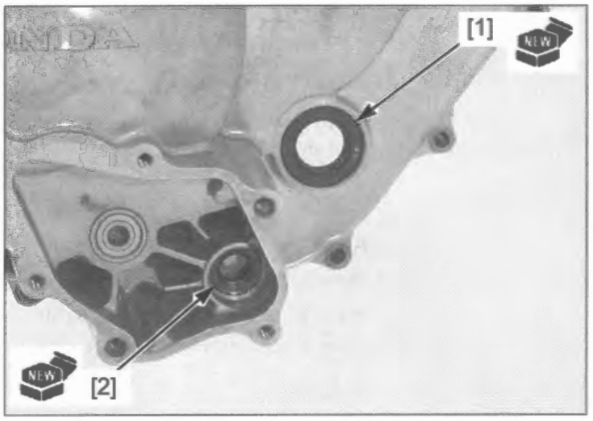
Blow through the oil passages in the front crankcase cover with compressed air.

Apply engine oil to the boss of the adjusting plate.



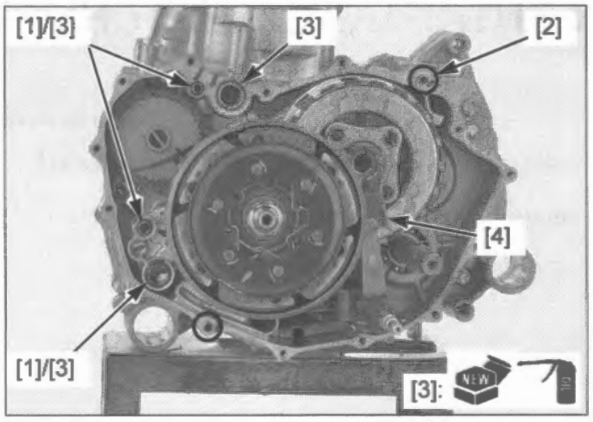
Install a new output shaft oil seal [1] into the front crankcase cover.

FE models: Install a new gearshift spindle oil seal [2] into the front crankcase cover.

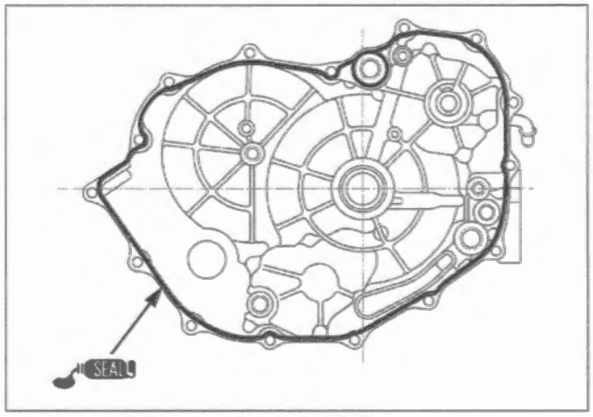


Install the joint collars [1] and dowel pins [2].
Coat new O-rings [3] with engine oil and install them.

Install the lifter cam plate [4].



Apply liquid sealant (TB1215 or equivalent) to the mating surface (shadowed area) of the front crankcase cover as shown.

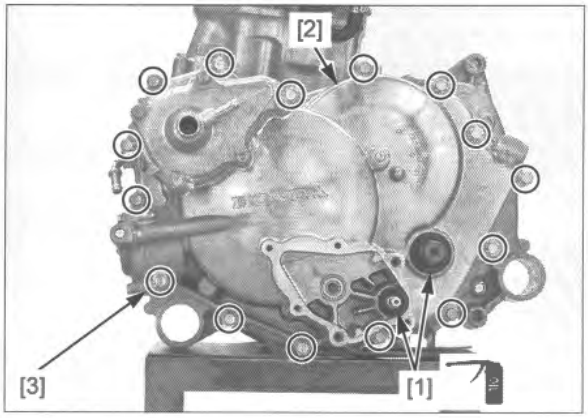


Apply engine oil to the lips of the oil seal [1].

Be careful not to drop the lifter cam plate.

Install the crankcase cover [2], being careful not to damage the oil seal lips.

Install the fifteen bolts [3] and tighten them in a crisscross pattern in several steps.



Connect the water hoses [1] and bleed hose [2] to the crankcase cover.

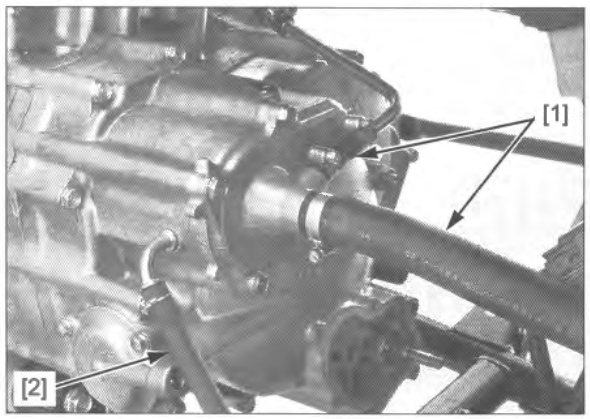
- Tighten the hose clamp screw securely (page 8-8).

Install the following:

– FE models only: reduction gears and shift control motor (page 25-34)
– front propeller shaft (page 21-57)
– center mudguards (page 2-5)

Adjust the clutch system (page 3-29).

Fill the engine with recommended oil (page 3-14).
Fill and bleed the cooling system (page 8-5).
Check the engine oil level (page 3-13).



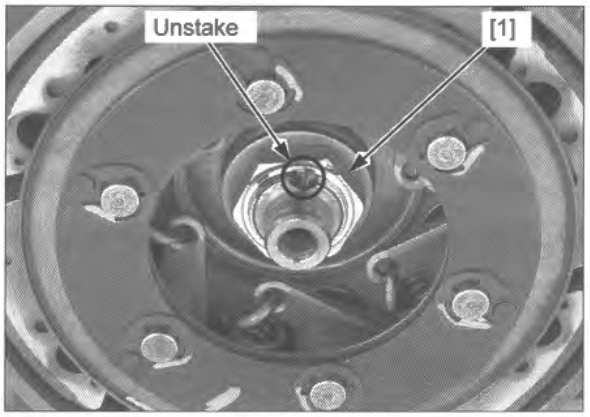
CENTRIFUGAL CLUTCH

REMOVAL

Remove the front crankcase cover (page 12-5).

Be careful not to damage the crankshaft threads.

Unstake the clutch lock nut [1].



Hold the clutch drive plate using the special tool [1] and loosen the lock nut [2].

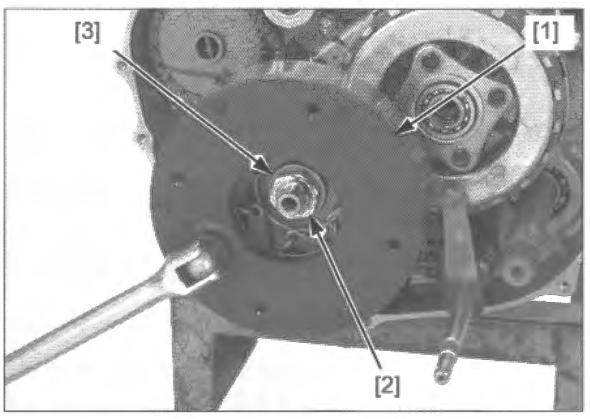
TOOLS:

Set Clutch Holder	**07ZMB-HN20001**
– Plate Clutch Holder	**07ZMB-HN20101**
– Pin Clutch Holder	**07ZMB-HN20200**

U.S.A. TOOL:

Clutch holder	**07ZMB-HN2A101**

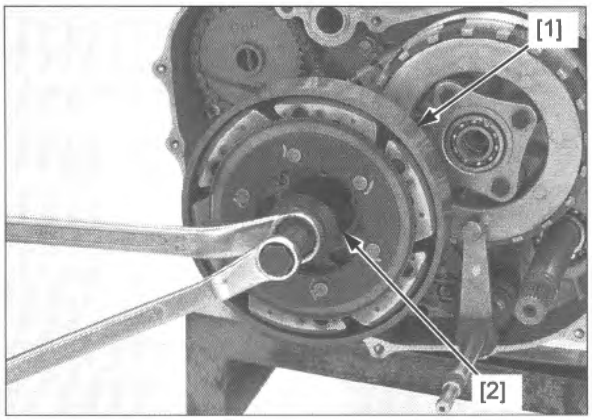
Remove the lock nut and washer [3].



Remove the centrifugal clutch assembly [1] using the special tool.

TOOL:

[2] Inside Screw Puller 35 x 1.0	**07933-HA80000 or 07933-HB3000A (U.S.A. only)**

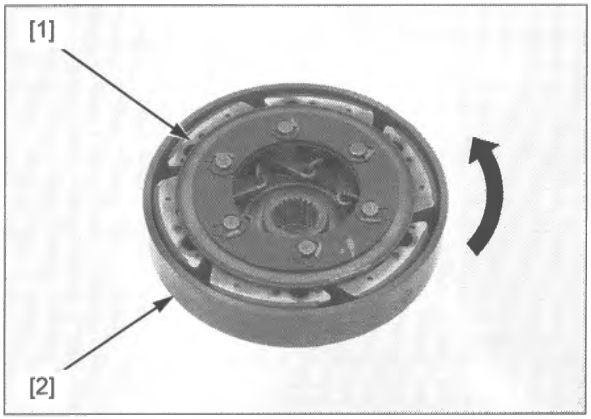


DISASSEMBLY/INSPECTION

ONE-WAY CLUTCH

You should be able to turn the clutch weight assembly [1] counterclockwise smoothly, but the assembly should not turn clockwise.

Remove the clutch weight assembly from the clutch drum [2] while turning it counterclockwise.



CLUTCH DRUM

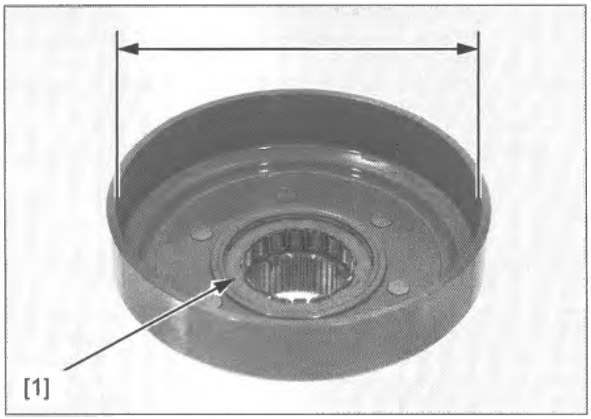
Check the weight contacting surface for scratches or abnormal wear.

Measure the drum I.D.

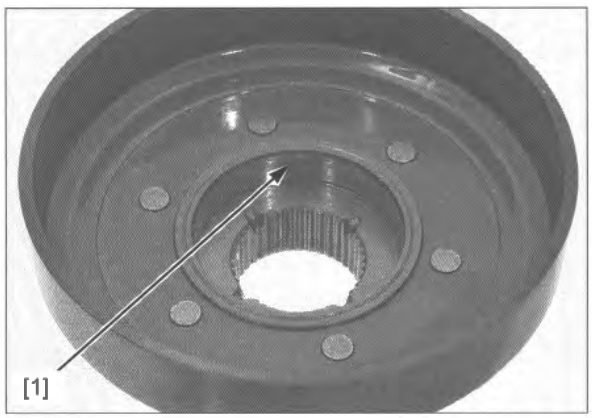
SERVICE LIMIT: 150.4 mm (5.92 in)

Check the sprag clutch for abnormal wear, damage or irregular movement.

Remove the sprag clutch [1] from the clutch drum.

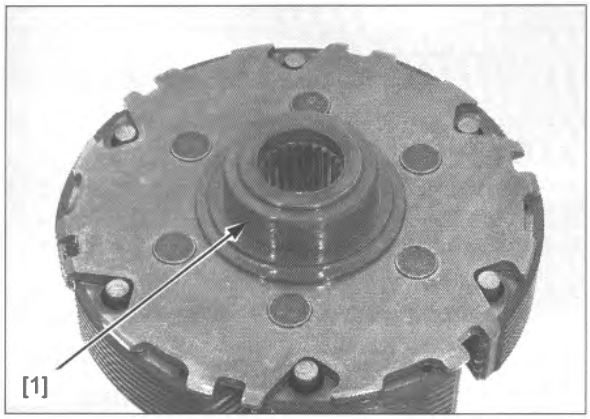


Check the sprag clutch contacting surface [1] for abnormal wear or damage.



DRIVE PLATE

Check the sprag clutch contacting surface [1] for abnormal wear or damage.



CLUTCH WEIGHT LINING

Replace the clutch weights as a set.

Measure the lining thickness.

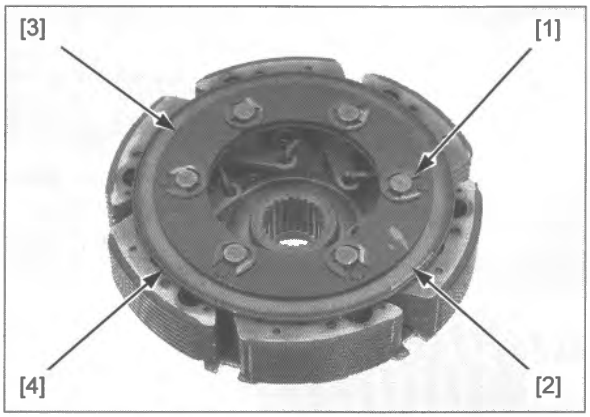
SERVICE LIMIT: 1.3 mm (0.05 in)



CLUTCH SPRING

Remove the E-clips [1] using a screwdriver while compressing the clutch spring [2].

Remove the following:
- outer plate [3]
- clutch spring
- inner plate [4]



Measure the clutch spring height.

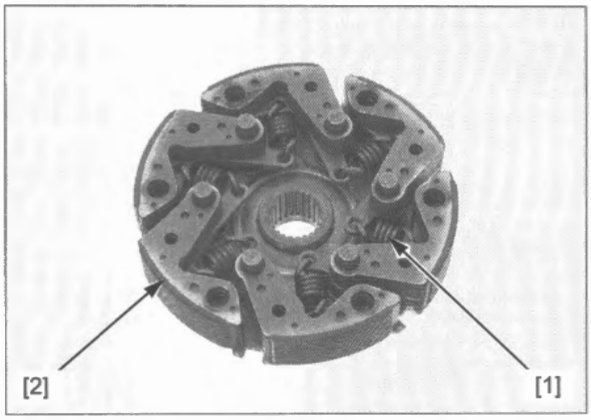
SERVICE LIMIT: 2.84 mm (0.112 in)



WEIGHT SPRING

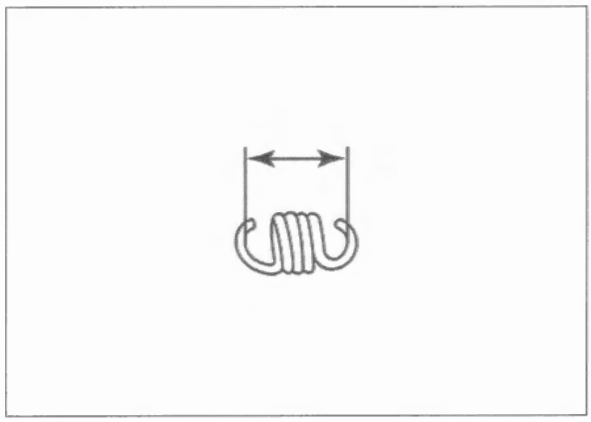
Replace the springs as a set.

Check the weight springs [1] for wear or damage.
Remove the clutch weights [2] and springs from the drive plate.

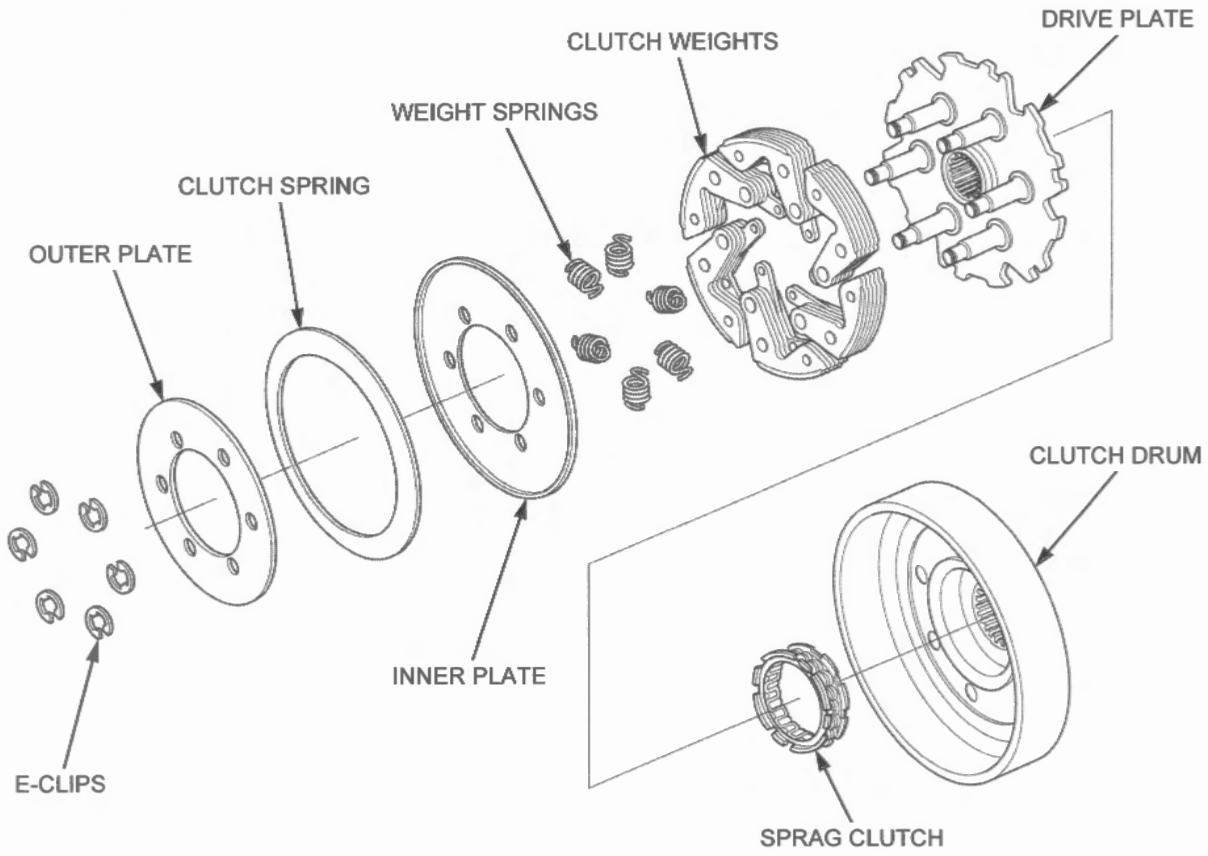


Measure the spring length.

SERVICE LIMIT: 25.7 mm (1.01 in)

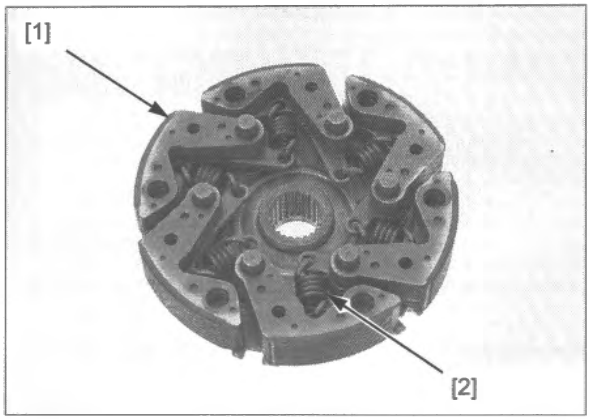


ASSEMBLY

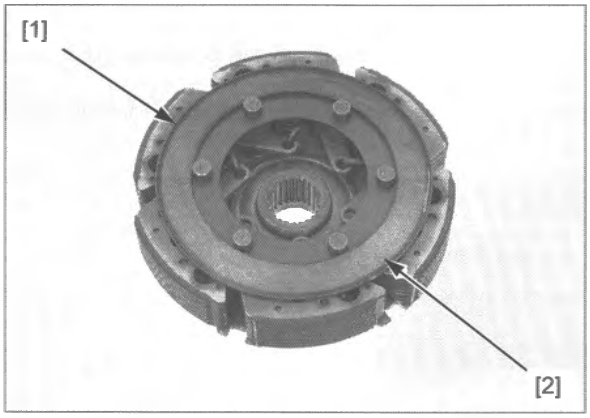


Install with the spring's open ends facing in.

Install the clutch weights [1] and springs [2] onto the drive plate as shown.



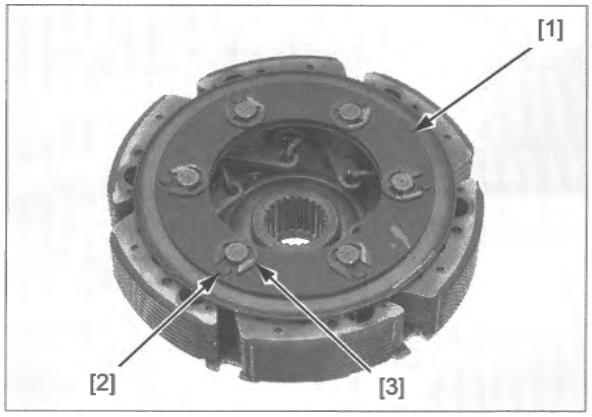
Install the inner plate [1] with flange side facing up.
Install the clutch spring [2] with concavity side facing down.



Install the outer plate [1] with the pins [2] facing up.

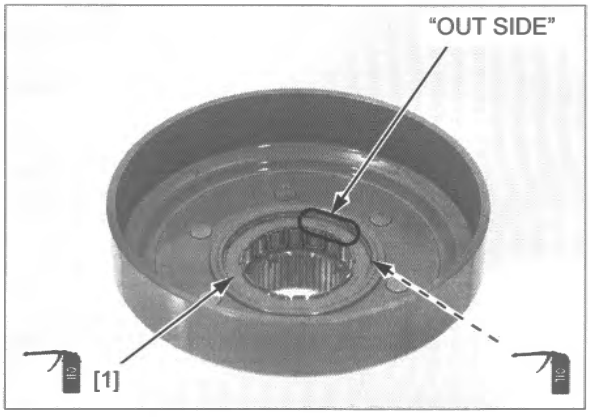
Be careful not to damage the clutch weights while compressing.

Install the E-clips [3] into the spindle grooves with its gap facing towards the pin by using the pliers while compressing the clutch spring.



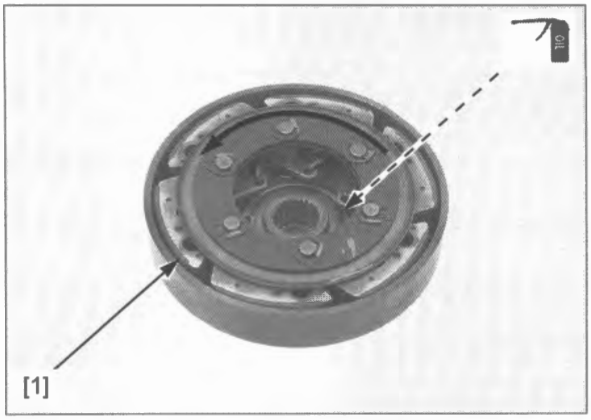
Apply engine oil to the whole surface of the sprag clutch [1] and the sprag clutch contacting surface of the clutch drum.

Install the sprag clutch into the clutch drum with the "OUT SIDE" mark facing up.



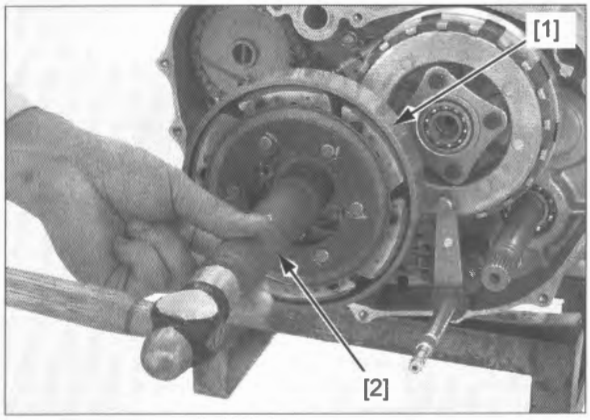
Apply engine oil to the sprag clutch contacting surface of the drive plate boss.

Install the clutch weight assembly [1] while turning it counterclockwise.



INSTALLATION

Set the centrifugal clutch assembly [1] onto the crankshaft by aligning the splines of the drive plate and crankshaft, and the splines of the clutch drum and primary drive gear.



Be careful not to damage the crankshaft threads.

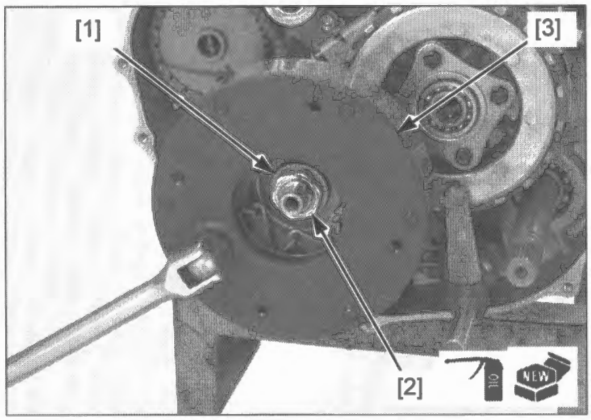
Tap the drive plate to seat it.

TOOL:

[2] Driver, 22 mm I.D.	**07746-0020100**

Install the washer [1].
And apply engine oil to the threads and seating surface of a new lock nut [2] and install it.

Hold the drive plate of the centrifugal clutch assembly with the special tool and tighten the lock nut to the specified torque.



TOOLS:

[3] Set Clutch Holder	**07ZMB-HN20001**
– Plate Clutch Holder	**07ZMB-HN20101**
– Pin Clutch Holder	**07ZMB-HN20200**

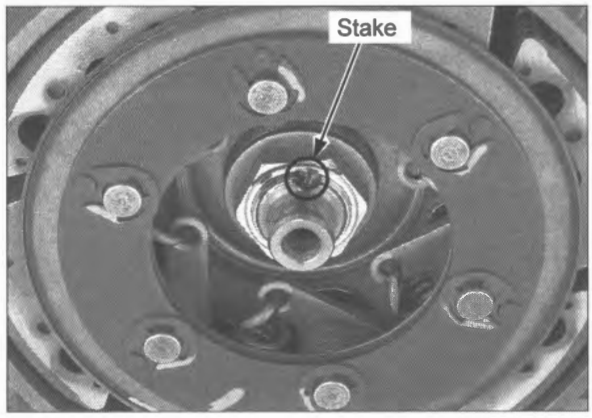
U.S.A. TOOL:

Clutch holder	**07ZMB-HN2A101**

TORQUE: 118 N·m (12.0 kgf·m, 87 lbf·ft)

Be careful not to damage the crankshaft threads.

Stake the lock nut into the crankshaft groove.



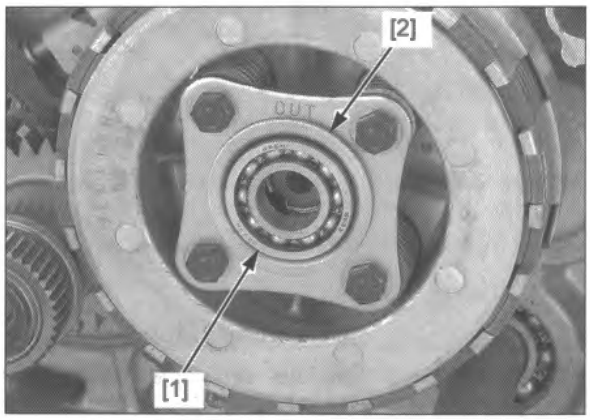
Install the front crankcase cover (page 12-7).

CHANGE CLUTCH

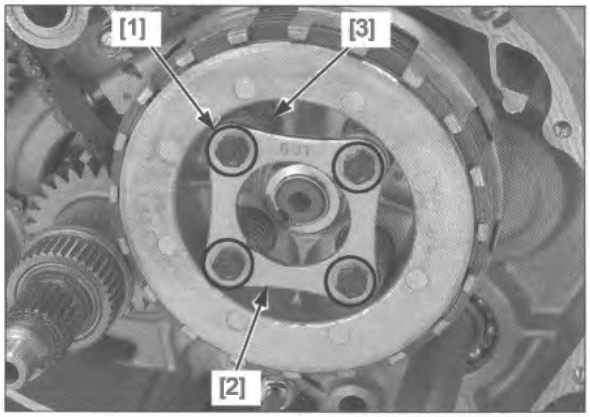
DISASSEMBLY

Remove the following:

- centrifugal clutch assembly (page 12-8)
- FE models: gearshift linkage (page 12-18)
- FM models: clutch lifter lever (page 12-18)
- lifter bearing [1] and collar [2]

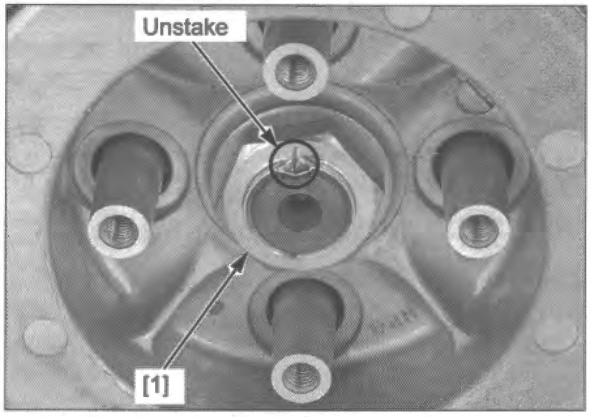


Loosen the clutch spring bolts [1] in a crisscross pattern in several steps, and remove the bolts, lifter plate [2] and clutch springs [3].



Be careful not to damage the mainshaft threads.

Unstake the clutch center lock nut [1].



Install the clutch center holder [1] onto the pressure plate bosses with the four clutch spring bolts [2].

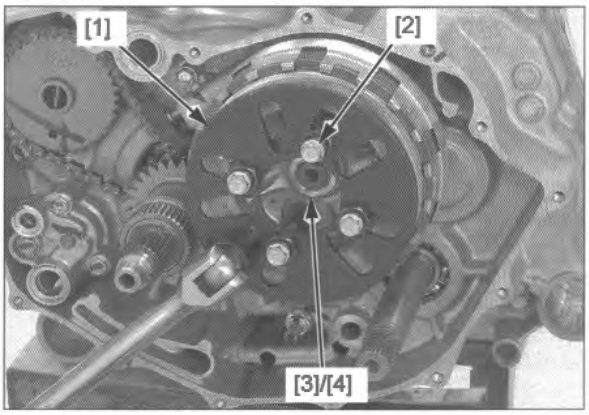
TOOL:

Holder Clutch Center	**07JMB-MN50302**

U.S.A. TOOLS:

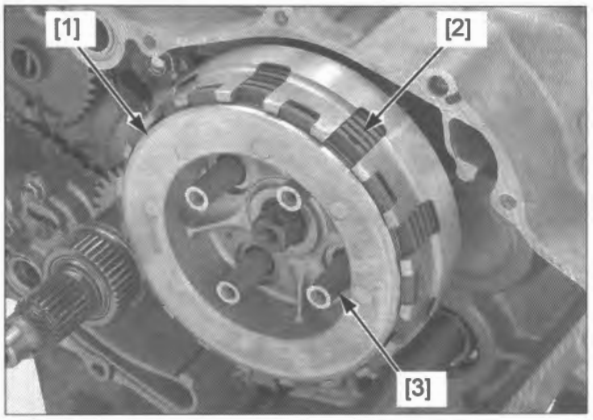
Holder plate	**07HGB-001010B or 07HGB-001010A**
	and
Holder collar A	**07HGB-001020B or 07HGB-001020A**

Hold the clutch center and loosen the clutch center lock nut [3].
Remove the lock nut and washer [4].

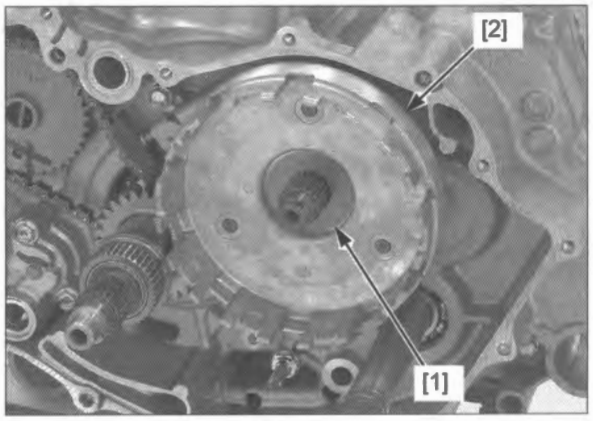


Remove the following:

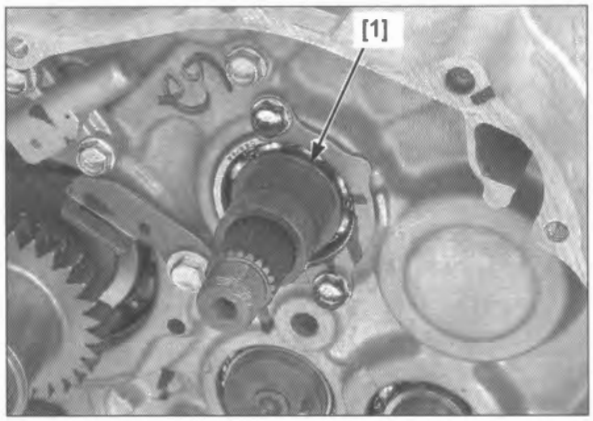
- clutch center [1]
- clutch discs and plates [2]
- pressure plate [3]



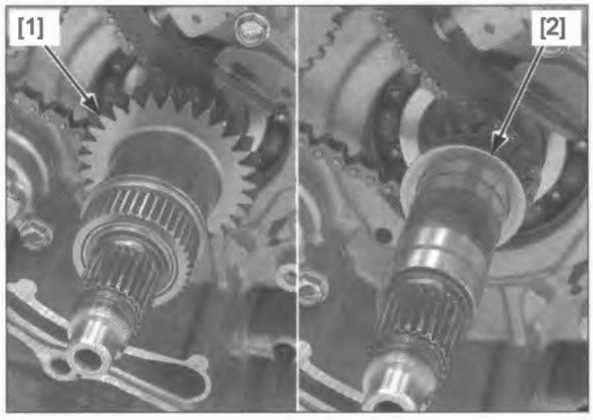
- thrust washer [1]
- clutch outer [2]



- clutch outer guide [1]

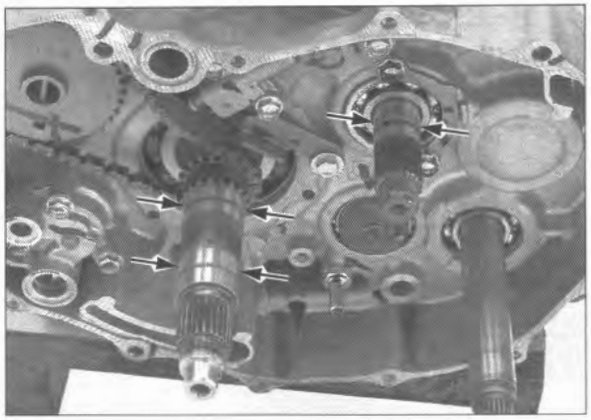


Remove the primary drive gear [1] and washer [2] from the crankshaft.



Inspect the following parts for scratches, damage, abnormal wear and deformation. Replace if necessary.

- lifter bearing/lifter plate/collar
- lifter cam plate
- clutch spring
- clutch discs/plates
- clutch center
- pressure plate
- clutch outer (primary driven gear)
- outer guide
- primary drive gear
- mainshaft
- crankshaft

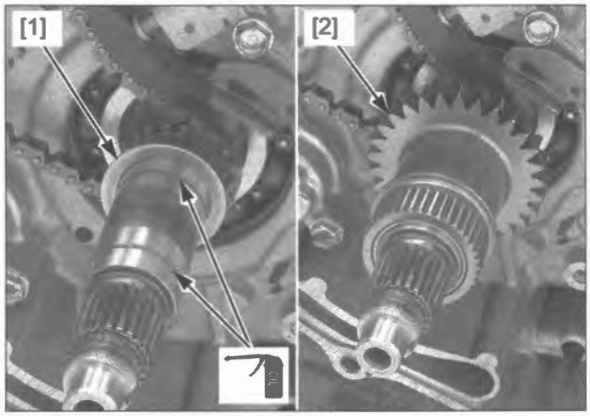


Measure each part according to CLUTCH/GEARSHIFT LINKAGE SPECIFICATIONS (page 1-13).
Replace any part if it is out of service limit.

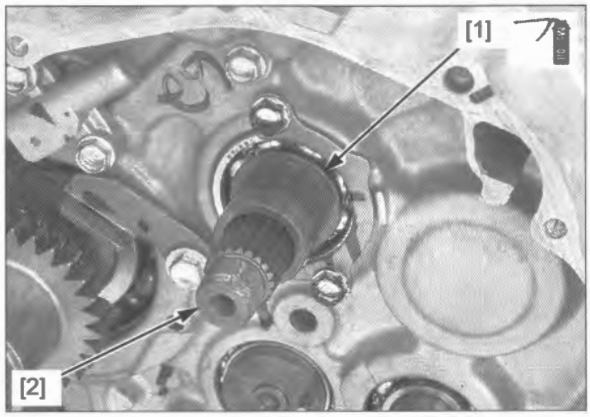
- Replace the clutch springs as a set.
- Replace the clutch discs and plates as a set.

ASSEMBLY

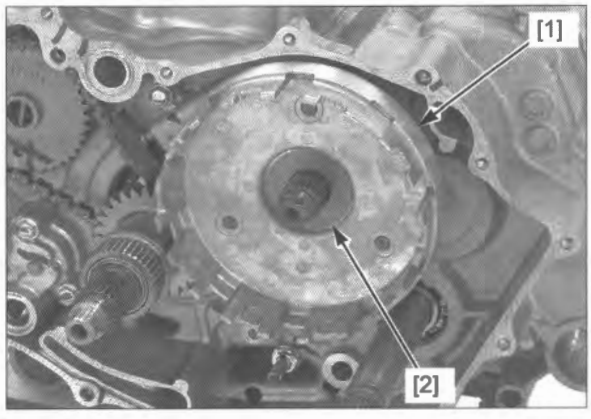
Apply engine oil to the primary drive gear sliding surface of the crankshaft.
Install the thrust washer [1] and the primary drive gear [2] onto the crankshaft.



Apply molybdenum oil solution to the inner and outer surfaces of the clutch outer guide [1].
Install the outer guide onto the mainshaft [2].



Install the clutch outer [1] and thrust washer [2].

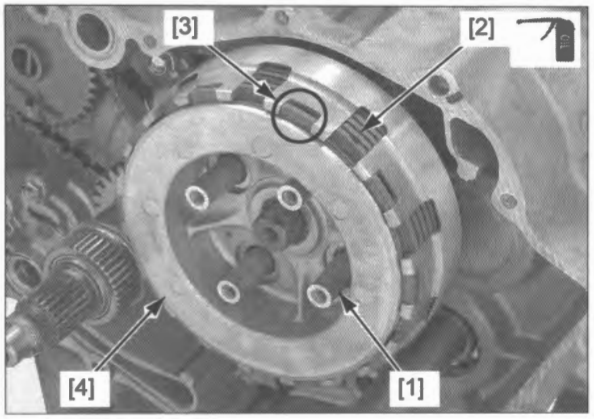


Coat the clutch discs with clean engine oil.

Install the discs and plates alternately, starting with a disc. Set the outside clutch disc tabs into the shallow slots [3] in the clutch outer.

Install the following:

- pressure plate [1]
- clutch discs and plates [2]
- clutch center [4]



Install the washer [1] to the mainshaft.
Apply engine oil to the threads and seating surface of a new lock nut [2], and install it.

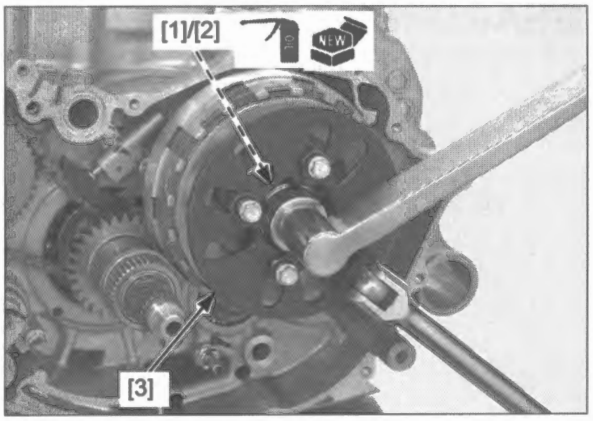
Install the clutch center holder [3] onto the pressure plate bosses with the four clutch spring bolts.

TOOL:

Clutch center holder	**07JMB-MN50302**

U.S.A. TOOLS:

Holder plate	**07HGB-001010B or 07HGB-001010A and**
Holder collar A	**07HGB-001020B or 07HGB-001020A**

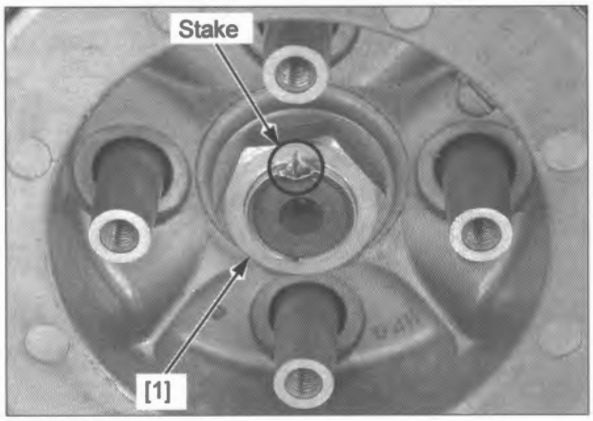


Hold the clutch center holder and tighten the lock nut to the specified torque.

TORQUE: 108 N·m (11.0 kgf·m, 80 lbf·ft)

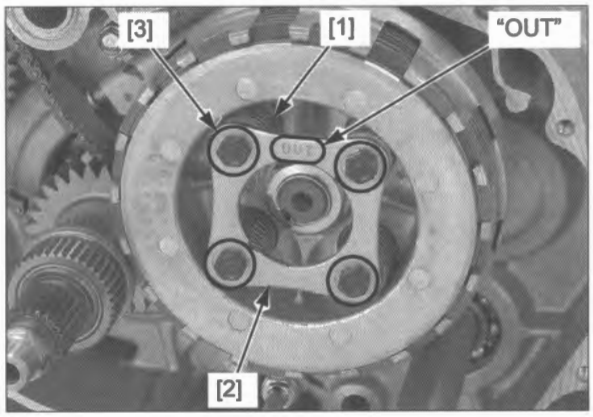
Be careful not to damage the mainshaft threads.

Stake the lock nut [1] into the mainshaft groove.



Install the clutch springs [1] and the lifter plate [2] with the "OUT" mark facing out.
Install the clutch spring bolts [3] and tighten them to the specified torque in a crisscross pattern in several steps.

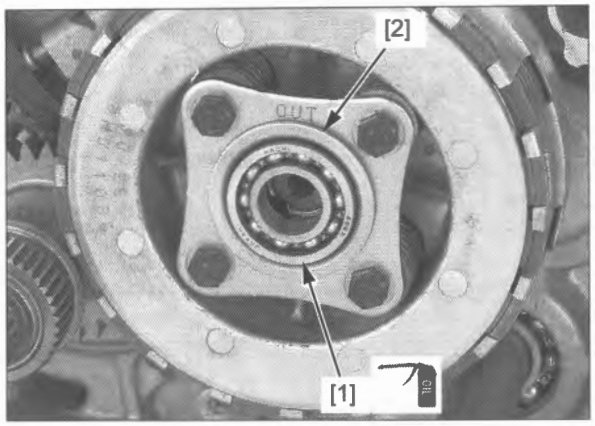
TORQUE: 13 N·m (1.3 kgf·m, 10 lbf·ft)



Apply engine oil to the lifter bearing [1], and install the lifter collar [2] and bearing.

Install the following:

- FE models: gearshift linkage (page 12-20)
- FM models: lifter lever (page 12-20)
- centrifugal clutch assembly (page 12-13)



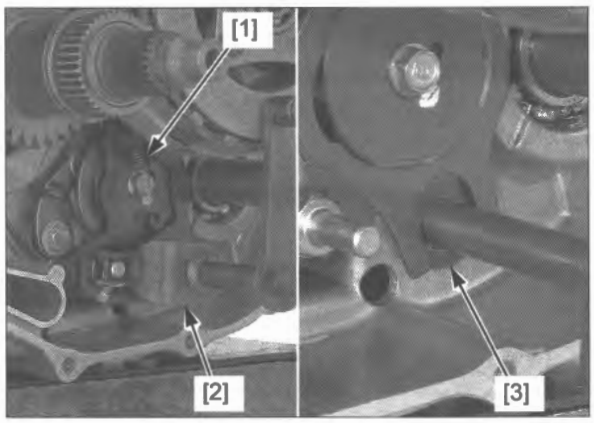
GEARSHIFT LINKAGE

REMOVAL

Remove the centrifugal clutch (page 12-8).

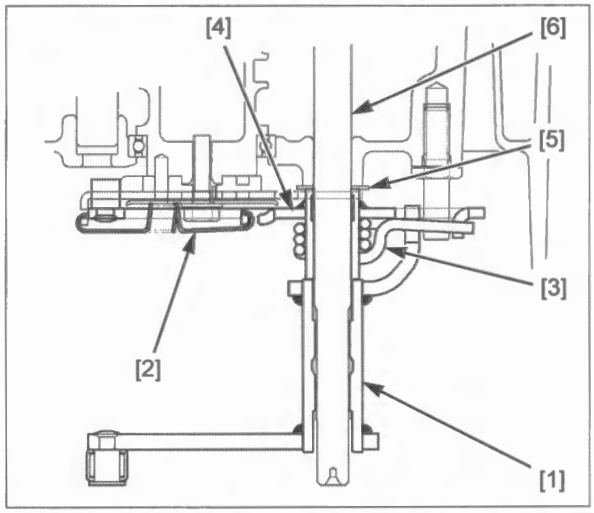
Remove the following:

FE models:
- shift spindle angle sensor (page 25-30)
- shift arm spring [1]
- gearshift spindle assembly [2] and washer [3]

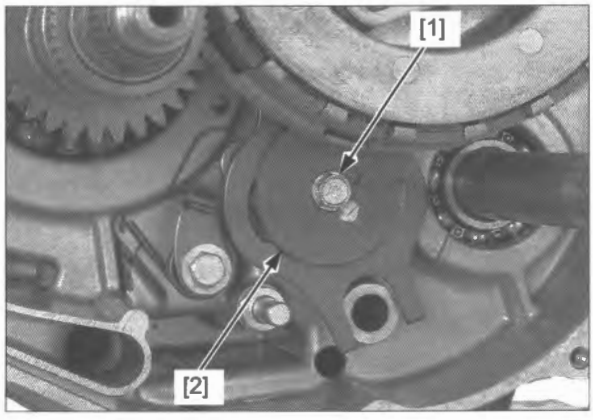


FM models:
- clutch lifter lever [1]
- shift arm spring [2]
- return spring [3] and gearshift arm [4]
- washer [5]

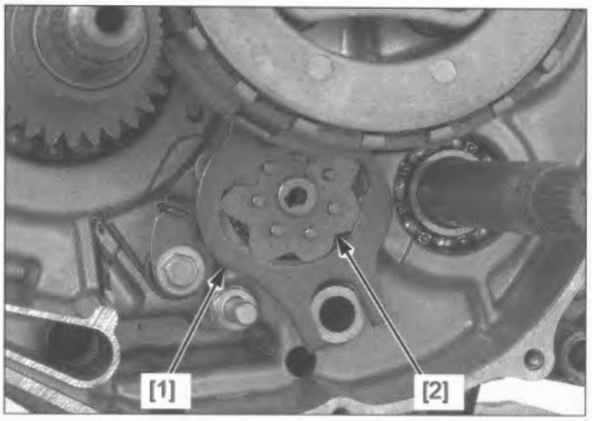
To service the gearshift spindles [6], remove the rear crankcase cover (page 12-21).



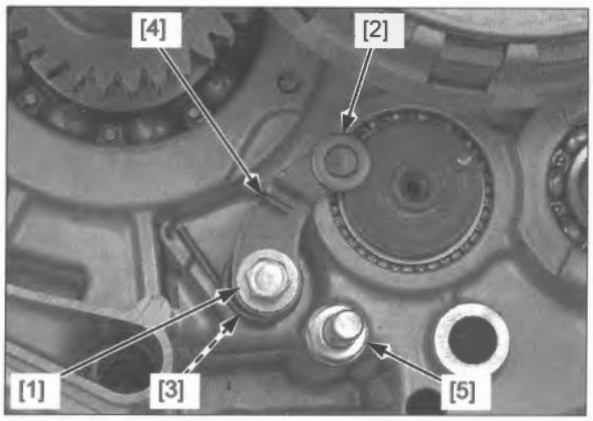
- bolt [1]
- guide plate [2]



- gearshift plate [1]
- FM models only: washer from the gearshift spindle
- gearshift cam [2] (while holding stopper arm with a screwdriver)



- pivot bolt [1]
- stopper arm [2]
- washer [3]
- return spring [4]
- gearshift spindle return spring pin [5]



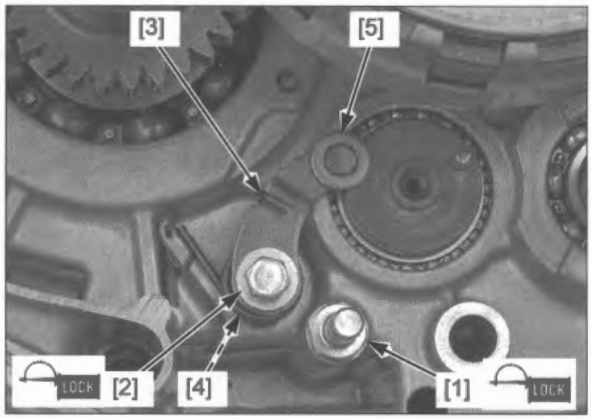
INSTALLATION

Apply locking agent to the threads of the gearshift spindle return spring pin [1] (page 1-17).
Install the gearshift return spring pin and tighten it to the specified torque.

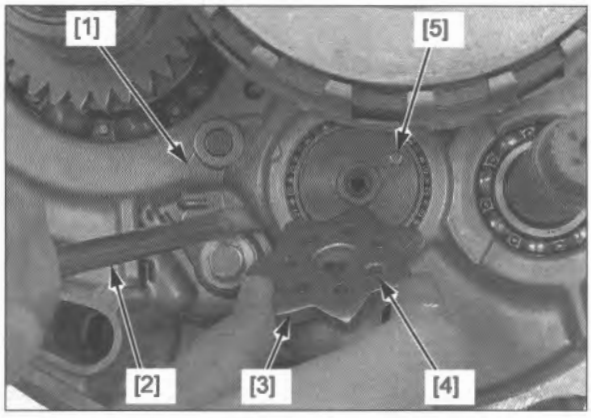
TORQUE: 22 N·m (2.2 kgf·m, 16 lbf·ft)

Apply locking agent to the threads of the stopper arm pivot bolt [2] (page 1-17).
Install the return spring [3], washer [4] (between the arm and crankcase), stopper arm [5] and pivot bolt.

- Tighten the pivot bolt after tightening the gearshift cam bolt.



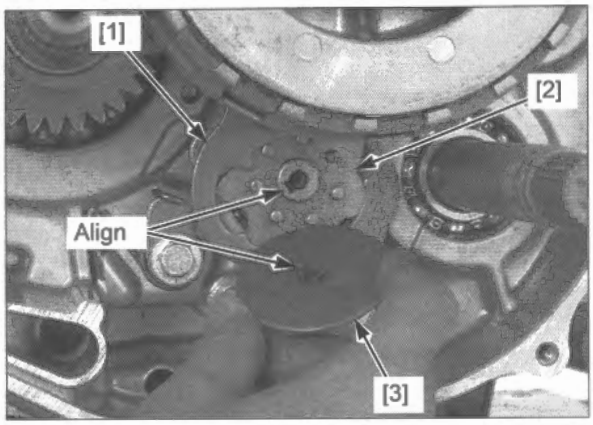
Hold the stopper arm [1] with a screwdriver [2] and install the gearshift cam [3] by aligning the pin hole [4] with the dowel pin [5].



FM models only: Install the washer onto the gearshift spindle.

Install the gearshift plate [1] onto the cam [2] as shown.

Install the guide plate [3] by aligning the tab with the groove in the cam.

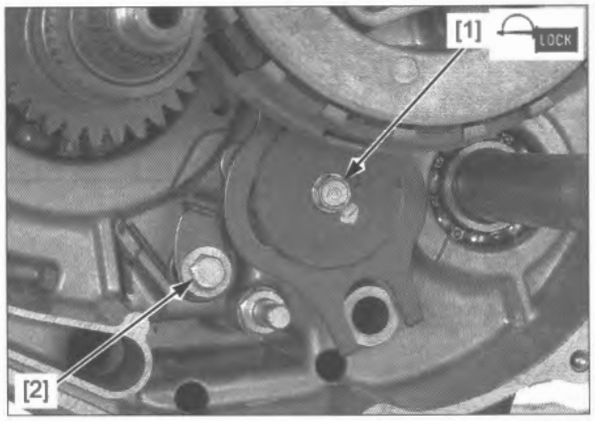


Apply locking agent to the threads of the gearshift cam bolt [1] (page 1-17).
Install the cam bolt and tighten it to the specified torque.

TORQUE: 16 N·m (1.6 kgf·m, 12 lbf·ft)

Tighten the stopper arm pivot bolt [2] to the specified torque.

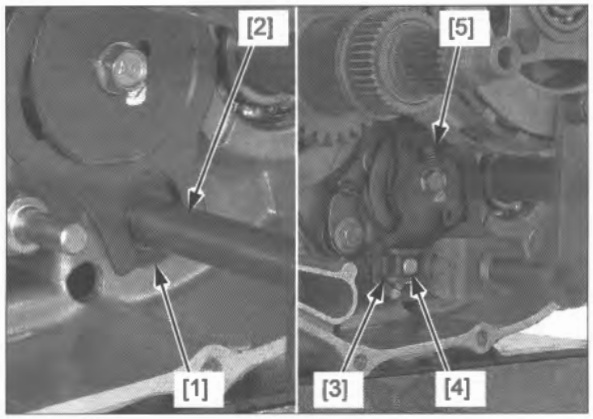
TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)



FE models: Install the washer [1] behind the gearshift plate and insert the gearshift spindle assembly [2] into the crankcase.
Align the return spring ends [3] with the stopper pin [4].

Hook the shift arm spring [5] to the gearshift arm and plate.

Install the shift spindle angle sensor (page 25-31).



FM models: Insert the gearshift spindle [1] from the rear crankcase side, then install the washer [2] in between the gearshift plate [3] and crankcase.

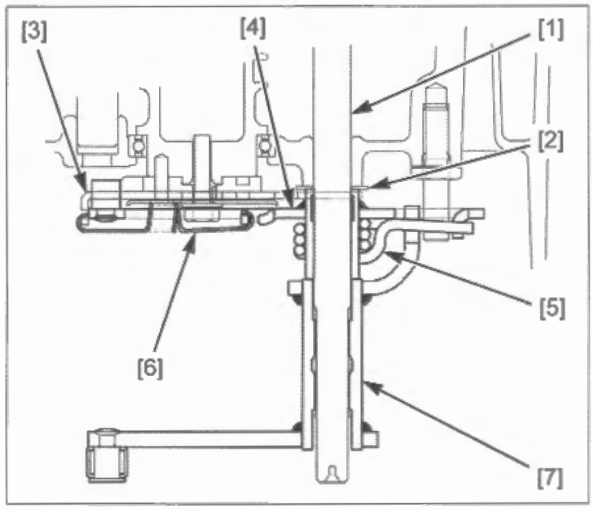
Install the gearshift arm [4] and return spring [5], aligning the spring ends with the stopper pin.

Hook the shift arm spring [6] to the gearshift arm and plate.

Install the lifter lever [7] by aligning the wide groove with the wide tooth of the splines.

Install the rear crankcase cover (page 15-14).

All models: Install the centrifugal clutch (page 12-13).



GEARSHIFT SPINDLE A (FM models)

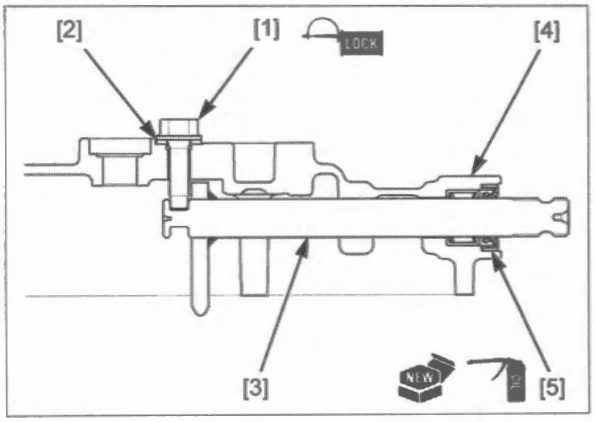
Remove the rear crankcase cover (page 15-8)

Remove the stopper bolt [1], washer [2] and gearshift spindle A [3] from the rear crankcase cover [4].
Remove the oil seal [5] from the rear crankcase cover.

Install a new oil seal.
Apply engine oil to the oil seal lip and install the gearshift spindle A.
Apply locking agent to the stopper bolt threads (page 1-17).
Install the washer and stopper bolt, and tighten the bolt.

TORQUE: 27 N·m (2.8 kgf·m, 20 lbf·ft)

Install the rear crankcase cover (page 15-14)



MEMO

13. DUAL CLUTCH TRANSMISSION (DCT: FA models)

SERVICE INFORMATION 13-2

SYSTEM COMPONENTS 13-4

SYMPTOM TROUBLESHOOTING 13-6

COMPONENT LOCATION 13-11

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SHIFT SPINDLE ANGLE SENSOR 13-57

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SHIFT CONTROL MOTOR/ REDUCTION GEARS 13-59

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REVERSE STOPPER SHAFT ('15 – '19) 13-87

SERVICE INFORMATION

GENERAL

- This section covers service of the electrical and mechanical systems of the Dual Clutch Transmission (DCT).
- A faulty DCT system is often related to poorly connected or corroded connectors. Check those connections before proceeding.
- Read the "DCT Troubleshooting Information" carefully, and inspect and troubleshoot the DCT system according to the DTC. Observe each step of the procedures one by one. Note the DTC and probable faulty part before starting diagnosis and troubleshooting.
- The PCM may be damaged if dropped. Also, if a connector is disconnected when current is flowing, the excessive voltage may damage the PCM. Always turn off the ignition switch before servicing.
- The drive mode (Automatic or ESP) is changed electrically with the drive mode select switch.
- Oil pump service (page 9-7).
- The following color codes are used throughout this section.

Bl: Black	Bu: Blue	Gr: Gray	Lg: Light green	P: Pink	V: Violet	Y: Yellow
Br: Brown	G: Green	Lb: Light blue	O: Orange	R: Red	W: White	

For DCT system Troubleshooting

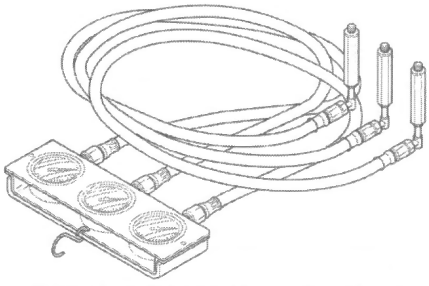
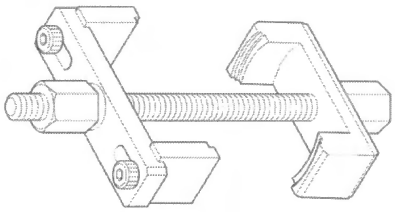
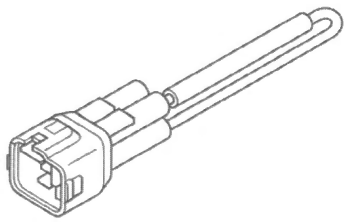
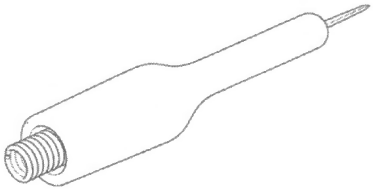
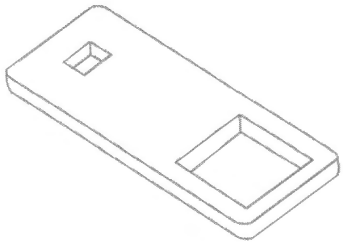
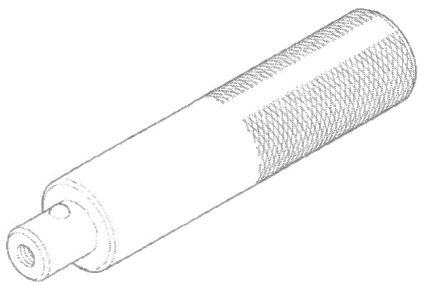
The DCT system is controlled by the PCM. Therefore some detection items that are shared in the PGM-FI and DCT systems, and they may affect the operation of both systems.

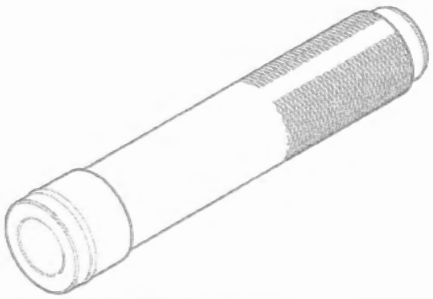
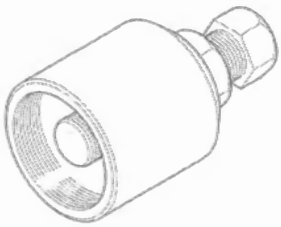
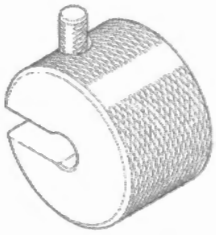
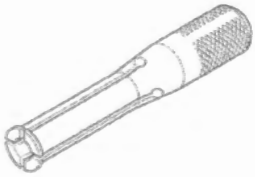
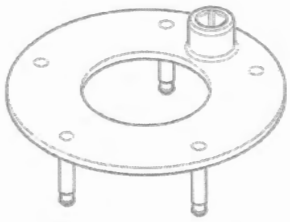
Before starting any troubleshooting, check the following items and refer to the appropriate troubleshooting.

1. MIL blinks DTC for the PGM-FI system (page 4-16).
2. Gear position indicator blinks DTC for the DCT system (page 13-15).
3. Symptom of the DCT system operation (page 13-6).

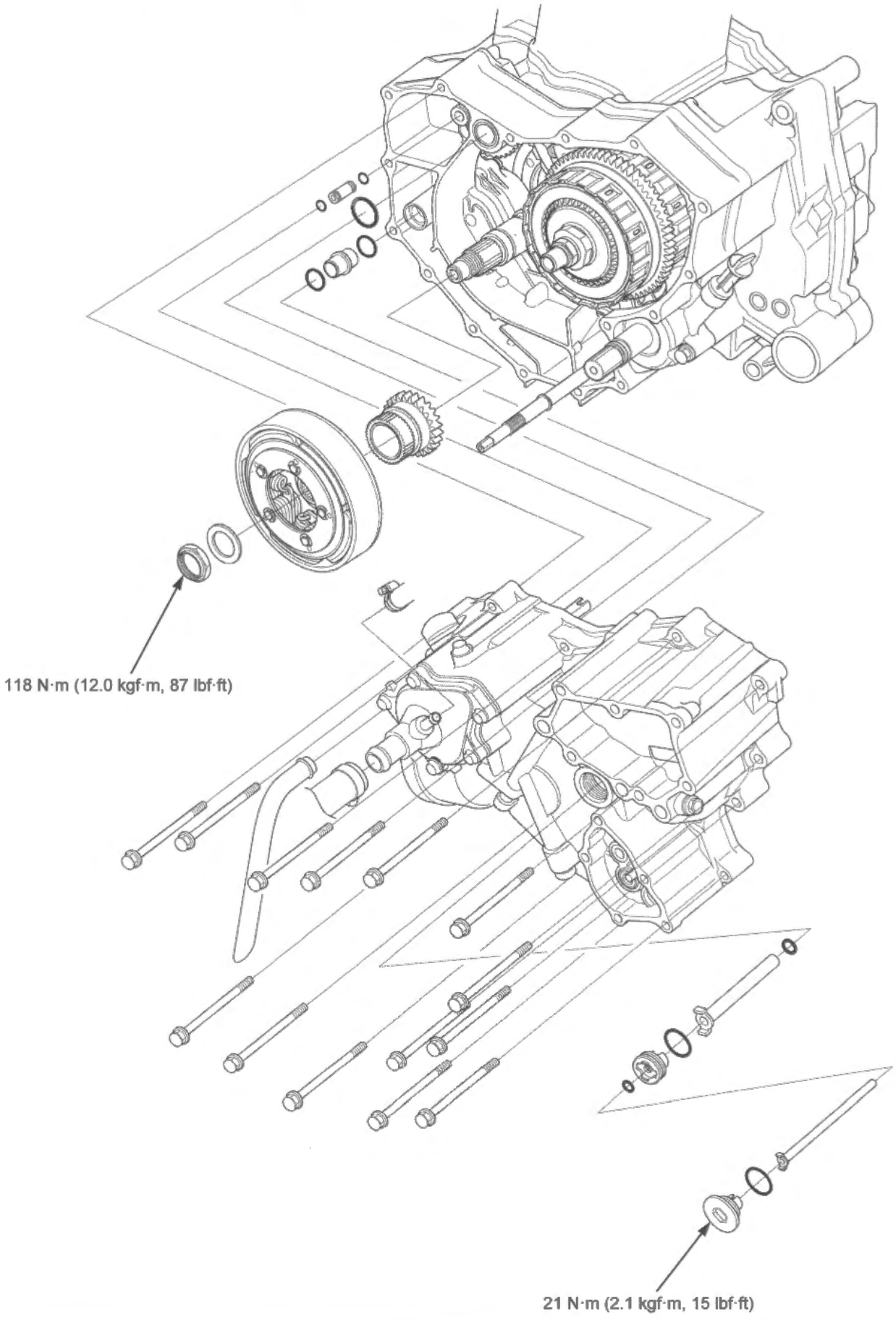
Refer to "PGM-FI Troubleshooting Information" for the general troubleshooting information (page 4-12).

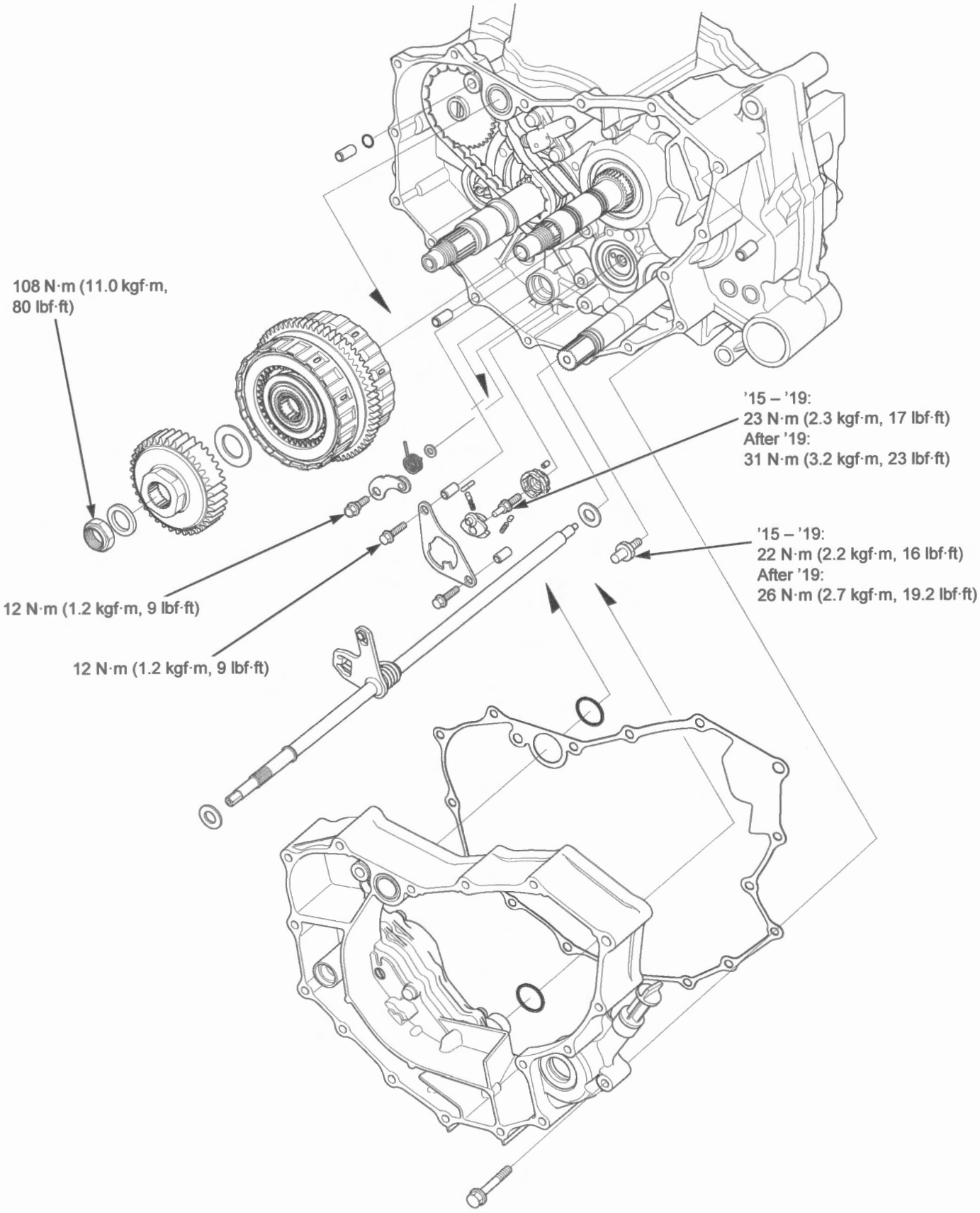
TOOLS

Pressure gauge set 07406-0020005  or 07ZMJ-HN2A100 (2 required) and 07AMJ-HN8A110 (U.S.A. only) and 07AMJ-HP7A100 (U.S.A. only)	Clutch compressor set 07LAE-PX40000  or 07GAE-PG40200 or 07GAE-PG4020A (U.S.A. only) and 07LAE-PX40100 (2 required)	SCS Service Connector 070PZ-ZY30100 
Pin Probe Male (2 pack) 07ZAJ-RDJA110 	Lock nut wrench, 32.5 mm 07AMA-HP7A100 	Driver 07749-0010000 

Attachment, 32 x 35 mm 07746-0010100 	Pilot, 15 mm 07746-0040300 	Driver, 22 mm I.D. 07746-0020100 
Clutch puller, 35 x 1.0 mm 07933-HA80000  or 07933-HB3000A (U.S.A. only)	Remover weight 07741-0010201  or 07936-371020A (U.S.A. only)	Bearing remover shaft 07936-KC10100 (not available in U.S.A.) 
Bearing remover head, 15 mm 07936-KC10200 (not available in U.S.A.) 	Bearing remover, 15 mm 07936-KC10500 (U.S.A. only) 	Clutch holder 07GMB-HA70101  or 07GMB-HA7010B (U.S.A. only)

SYSTEM COMPONENTS




108 N·m (11.0 kgf·m, 80 lbf·ft)
'15 – '19:
23 N·m (2.3 kgf·m, 17 lbf·ft)
After '19:
31 N·m (3.2 kgf·m, 23 lbf·ft)
'15 – '19:
22 N·m (2.2 kgf·m, 16 lbf·ft)
After '19:
26 N·m (2.7 kgf·m, 19.2 lbf·ft)
12 N·m (1.2 kgf·m, 9 lbf·ft)
12 N·m (1.2 kgf·m, 9 lbf·ft)

SYMPTOM TROUBLESHOOTING

GENERAL INFORMATION

If the ATV has any DCT trouble, check the DTC or gear position indicator blinking, refer to the DTC index and begin the appropriate troubleshooting procedure (page 13-17).

If there are no DTC stored in the PCM memory, do the troubleshooting as following symptom and then inspect the oil pressure and diagnose according to the troubleshooting chart (page 13-10).

Symptom	Diagnosis procedure	Also check for
Starting control failure	Check the centrifugal clutch system (page 13-51). Refer to the following symptom troubleshooting: • Vehicle does not accelerate (page 13-6) • Excessive starting shock (page 13-7)	• Engine oil level (page 3-13) • Oil pressure (page 13-8)
Shift control failure	Refer to the following symptom troubleshooting: • DCT does not shift (page 13-7) • When shifting in the AUTO (automatic) mode, excessive shift shock, engine rpm rises or driving power falls off (page 13-8)	• Engine oil level (page 3-13) • Oil pressure (page 13-8)
Gear position indicator shows "–" but no DTC set	Check the shift drum position switch and its circuit (for open circuit) (page 13-62)	• Serial communication line (page 24-9)
Gear position indicator shows nothing and MIL stays on at all times (No DTC set)	Check the DLC circuit (Brown/red wire) for short circuit.	• Short circuit in the DLC related wire

STARTING CONTROL FAILURE

Vehicle Does Not Accelerate

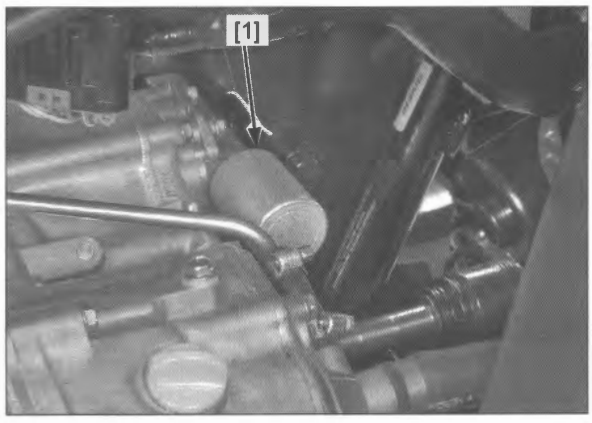
1. **Dual Clutch PC Solenoid Valve Operation Sound Check**

   Remove the tank cover assembly (page 2-4).
   Check for a "click" sound from the dual clutch PC solenoid valve [1] when the ignition switch is turned ON.

   Is there sound?

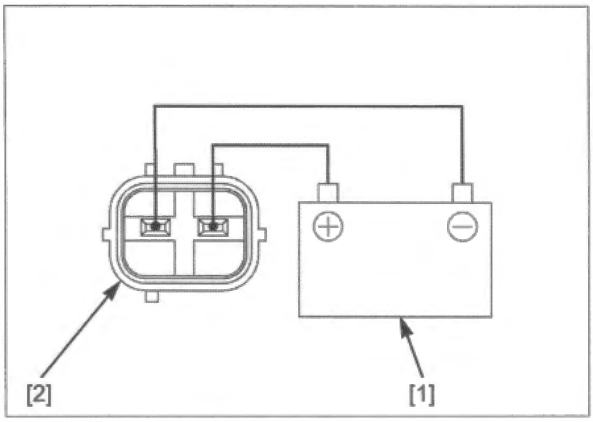
   YES – GO TO STEP 3.

   NO – GO TO STEP 2.



2. Dual Clutch PC Solenoid Valve Operation Check

Turn the ignition switch OFF.
Disconnect the dual clutch PC solenoid 2P connector.
Connect a 12 V battery [1] to the solenoid valve connector [2] terminals as shown.
The solenoid valve should operate (sounds) when the battery is connected.



Does the solenoid operate?

YES – GO TO STEP 3.

NO – Faulty dual clutch PC solenoid valve.

3. Vehicle Test-riding

Turn the mode select switch to ESP.
Accelerate the vehicle with the transmission in 2nd gear.

Does the vehicle accelerate?

YES – Faulty 1st shift clutch system (page 13-74).

NO – Hydraulic circuit malfunction is the likely cause. Check the oil pressure (page 13-8).

Excessive Jerking when Accelerating

1. Vehicle Test-riding

Turn the drive mode select switch to ESP.
Check for acceleration jerking with the transmission in the 2nd gear.

Is there acceleration jerking with the transmission in 2nd gear?

YES – Hydraulic circuit malfunction is the likely cause. Check the oil pressure (page 13-8).

NO – Faulty 1st shift clutch system (page 13-74).

SHIFT CONTROL FAILURE

DCT Does Not Shift

1. Vehicle Test-riding

Test-ride the vehicle with the drive mode select switch at ESP and shift the transmission with the gearshift switch.

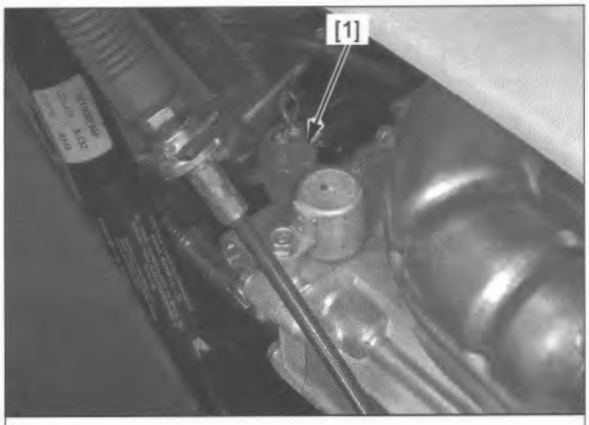
Does the transmission shift?

YES – • Faulty TP sensor system. Check the installation condition (page 4-40).
• Faulty VS sensor system. Check the installation condition (page 13-66).

NO – GO TO STEP 2.

2. Shift Solenoid Valve Operation Check

Turn the ignition switch OFF.
Remove the tank cover assembly (page 2-4).
Disconnect the shift solenoid valve 2P connector [1].

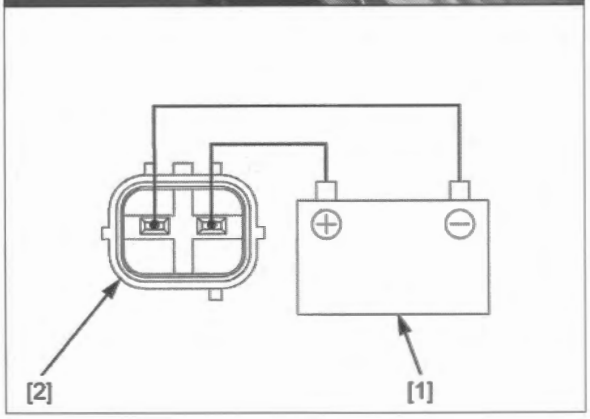


Connect a 12 V battery [1] to the solenoid valve connector [2] terminals as shown.
The shift solenoid valve should operate (sound) when the battery is connected.

Does the solenoid valve operate?

YES – Hydraulic circuit malfunction is likely cause. Check the oil pressure (page 13-8).

NO – Faulty shift solenoid valve.



When Shifting in the AUTO (automatic) Mode, Excessive Shift Shock, Engine rpm Rises or Driving Power Falls Off

1. Vehicle Test-riding

Test-ride the vehicle with the drive mode select switch at ESP. Check above symptoms when shifting with the gearshift switch.

Are there repeated symptoms?

YES – Hydraulic circuit malfunction is likely cause. Check the oil pressure (page 13-8).

NO – • Faulty TP sensor system; Check the installation condition (page 4-40).
• Faulty VS sensor system. Check the installation condition (page 13-66).

OIL PRESSURE CHECK

NOTE:

- If the oil pressure is abnormal, inspect and clean the parts according to the hydraulic circuit troubleshooting chart (page 13-10).
- Failure to warm the engine will cause very high oil pressure readings.
  External leaks will cause low oil pressure readings.

Check the oil level and add the recommended engine oil if necessary (page 3-13).

Warm the engine to normal operating temperature and check for external oil leaks.

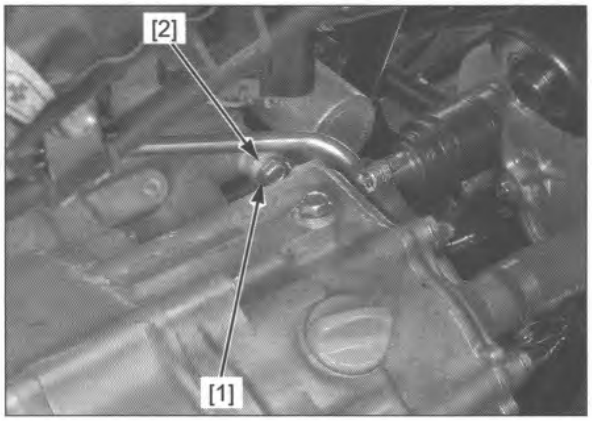
LINE OIL PRESSURE

Remove the tank cover assembly (page 2-4).

Clean around the sealing bolt [1] with compressed air.

Be sure that no dirt is allowed to enter the oil gallery.

Remove the sealing bolt and sealing washer [2] from the right side of the shift valve body.



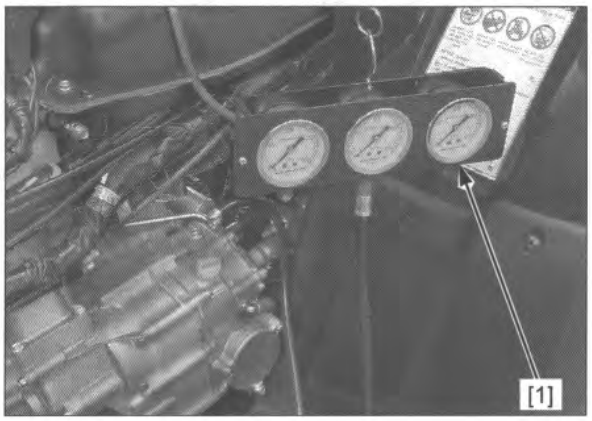
Connect the oil pressure gauge and adapter to the sealing bolt hole (hole threads: M8 x 1.25).

Except U.S.A. TOOL:
[1] Pressure gauge set 07406-0020005

U.S.A. TOOLS:
Oil pressure gauge 0–160 psi 07ZMJ-HN2A100 and
Adaptor, banjo 8 x 1.25 mm 07AMJ-HN8A100

Shift the transmission into neutral.
Start the engine and measure the oil pressure.

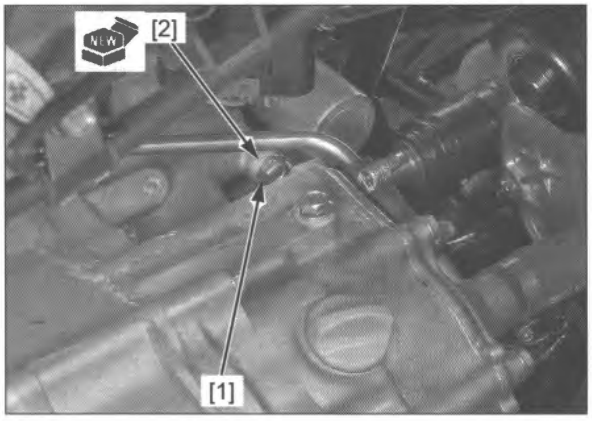
LINE OIL PRESSURE (80°C/176°F):
510 kPa (5.2 kgf/cm², 74 psi) at 5,000 rpm



Stop the engine.
Remove the pressure gauge and adaptor.

Install the sealing bolt [1] with a new sealing washer [2] and tighten it.

Install the tank cover assembly (page 2-4).



SHIFT CLUTCH OIL PRESSURE

Remove the tank cover assembly (page 2-4).

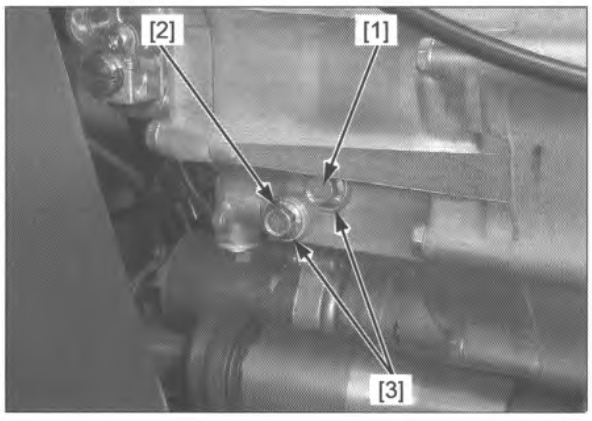
Be careful not touch the rotating wheels during inspection.

Support the vehicle using a hoist or equivalent and raise all the wheels off the ground.

Clean around the sealing bolts with compressed air.

Be sure that no dirt is allowed to enter the oil gallery.

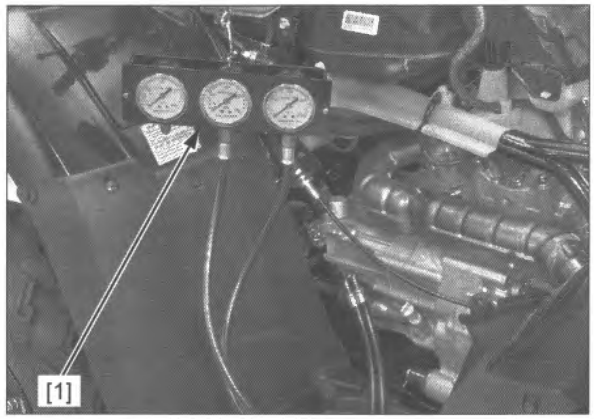
Remove the sealing bolt (for 1st clutch) [1], sealing bolt (for 2nd clutch) [2] and sealing washers [3] from the left side of the front crankcase cover.



Connect the oil pressure gauges and adaptors to the sealing bolt holes (hole threads: M8 x 1.25).

Except U.S.A. TOOL:
[1] Pressure gauge set 07406-0020005

U.S.A. TOOLS:
Oil pressure gauge 0–160 psi (2 required) 07ZMJ-HN2A100 and
Adapter, banjo 8 x 1.25 mm 07AMJ-HN8A100 and
Adapter, 25 L x 8 x 1.25 mm 07AMJ-HP7A100

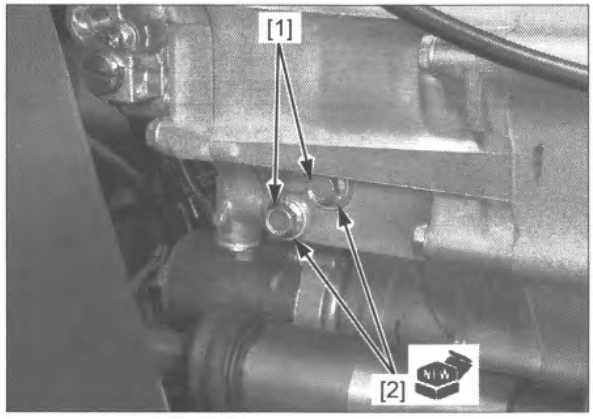


Turn the drive mode select switch to ESP.
Start the engine and measure the oil pressure at 1st gear and 2nd gear.

SHIFT CLUTCH OIL PRESSURE (80°C/176°F):
510 kPa (5.2 kgf/cm², 74 psi) at 5,000 rpm

Stop the engine.
Remove the pressure gauges and adaptors.
Install the sealing bolts [1] with new sealing washers [2] and tighten them.

Install the tank cover assembly (page 2-4).

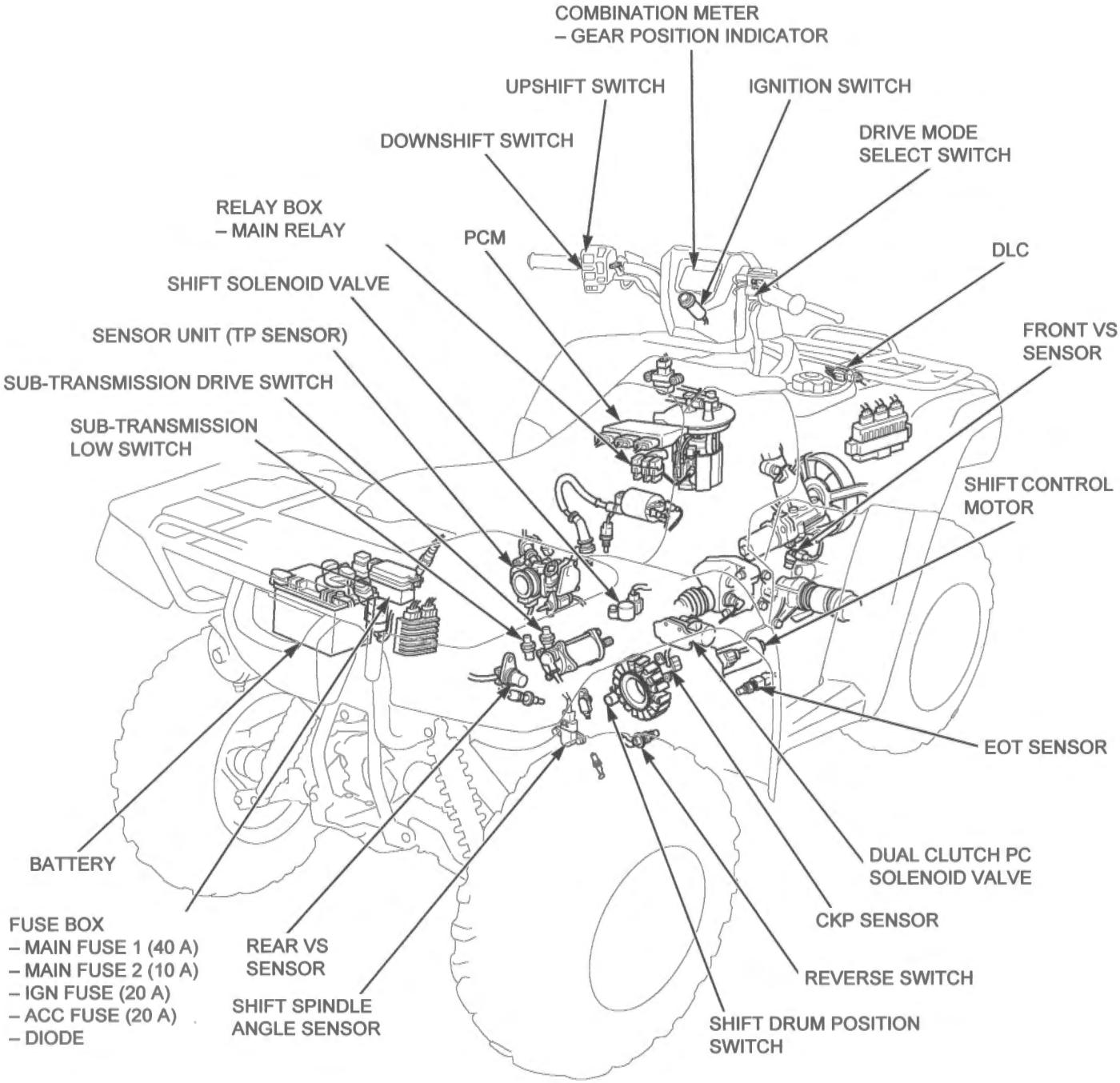


TROUBLESHOOTING CHART OF HYDRAULIC CIRCUIT

PRESSURE CHECK SECTION		MEASUREMENT RESULT (■: Abnormal, Blank: Normal)				Refer to page
Line pressure					■	
1st clutch pressure		■		■	■	
2nd clutch pressure			■	■	■	
Probable Faulty Part (applied to O)	Dual clutch PC solenoid valve			O		13-68
	Emergency valve			O		
	Shift valve	O	O			
	Shift solenoid valve	O				
	Valve body base			O		
	Valve body			O		
	1st shift clutch	O				13-74
	2nd shift clutch		O			
	Feed pipe A		O			13-44
	Feed pipe B	O				
	Oil guide pin	O	O		O	
	Oil pump				O	9-7
	Oil filter				O	3-14
	Oil strainer				O	12-5
	Oil level				O	3-13

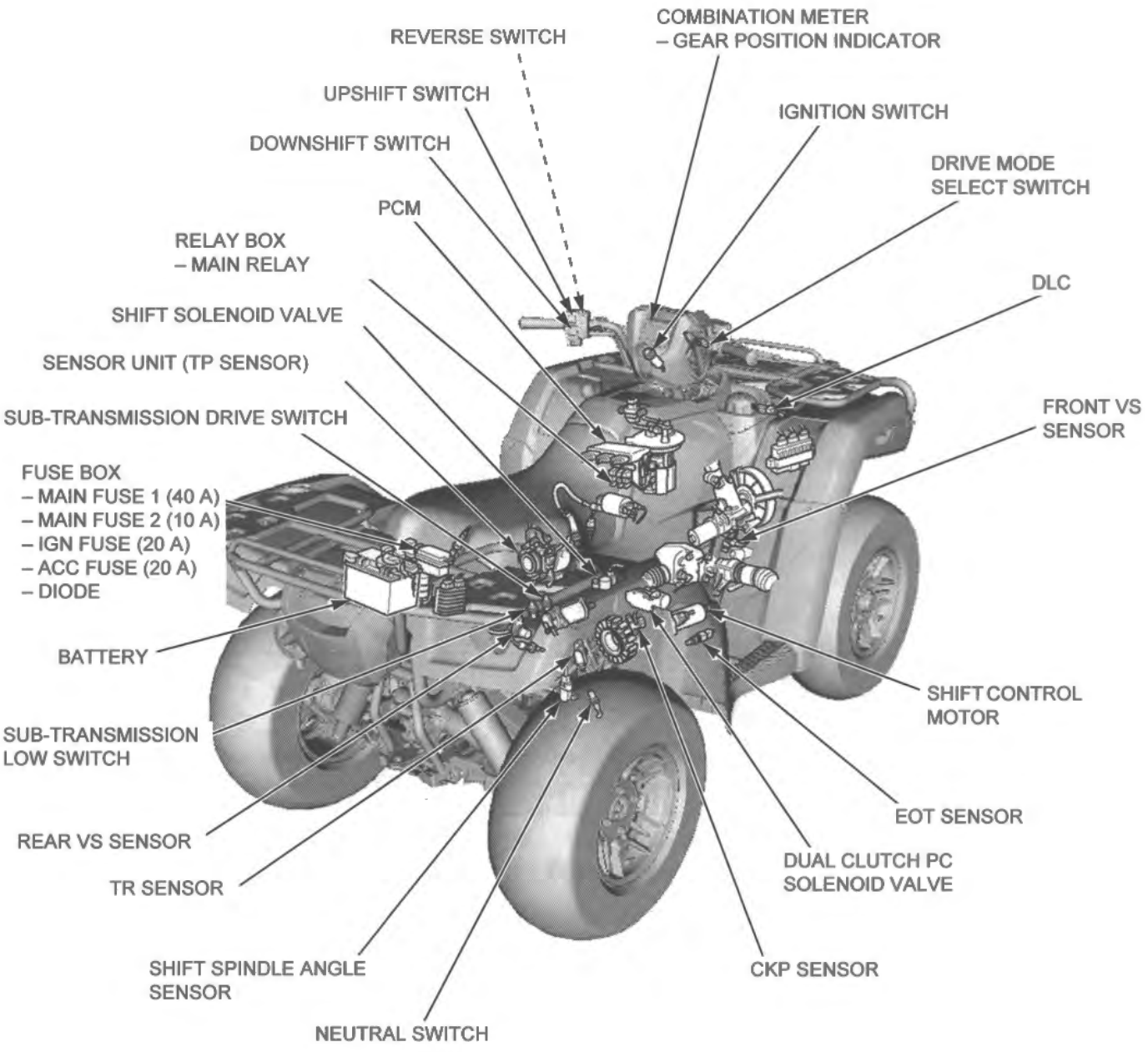
COMPONENT LOCATION

'15 – '19:



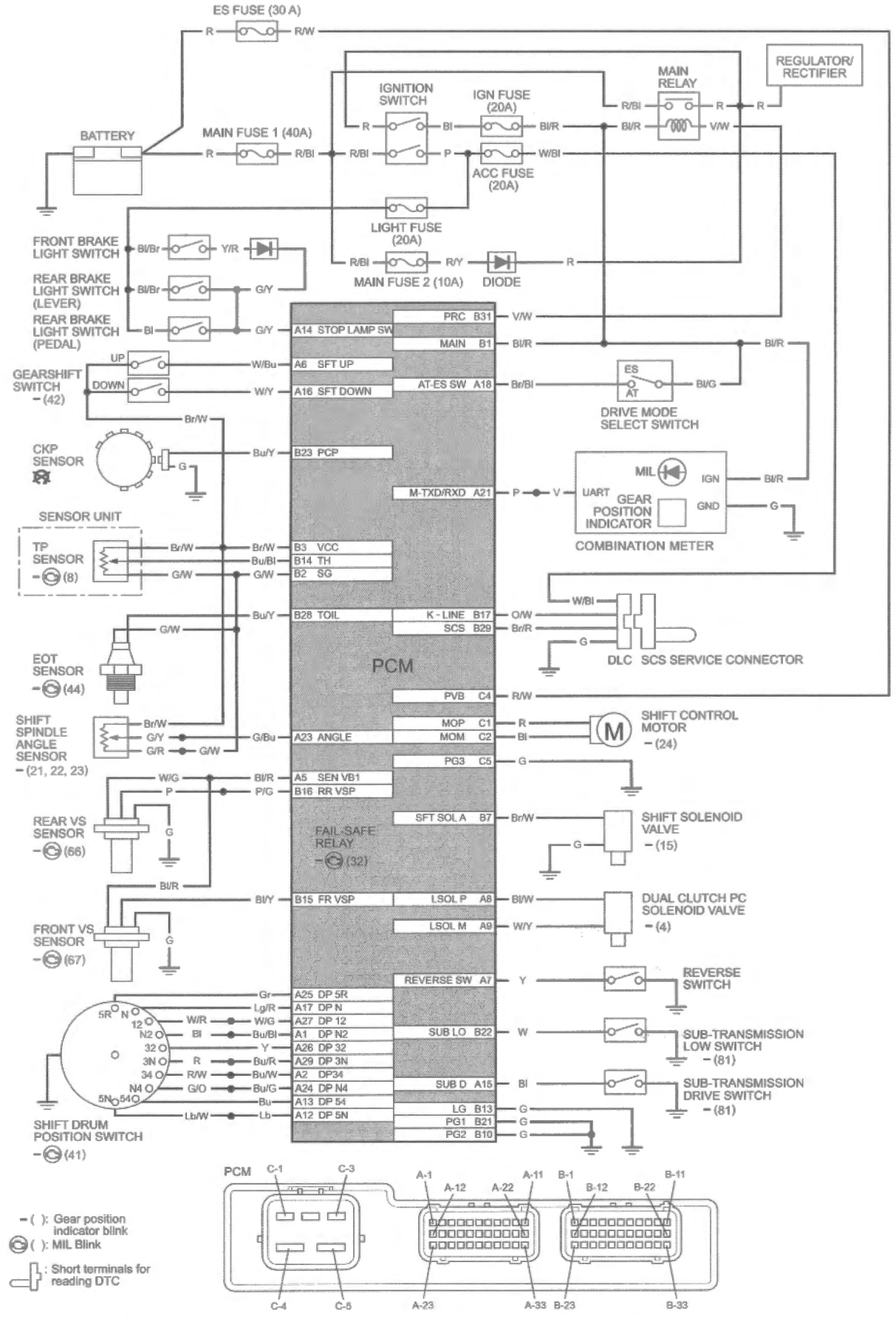
After '19:

'20 – '21 models shown:

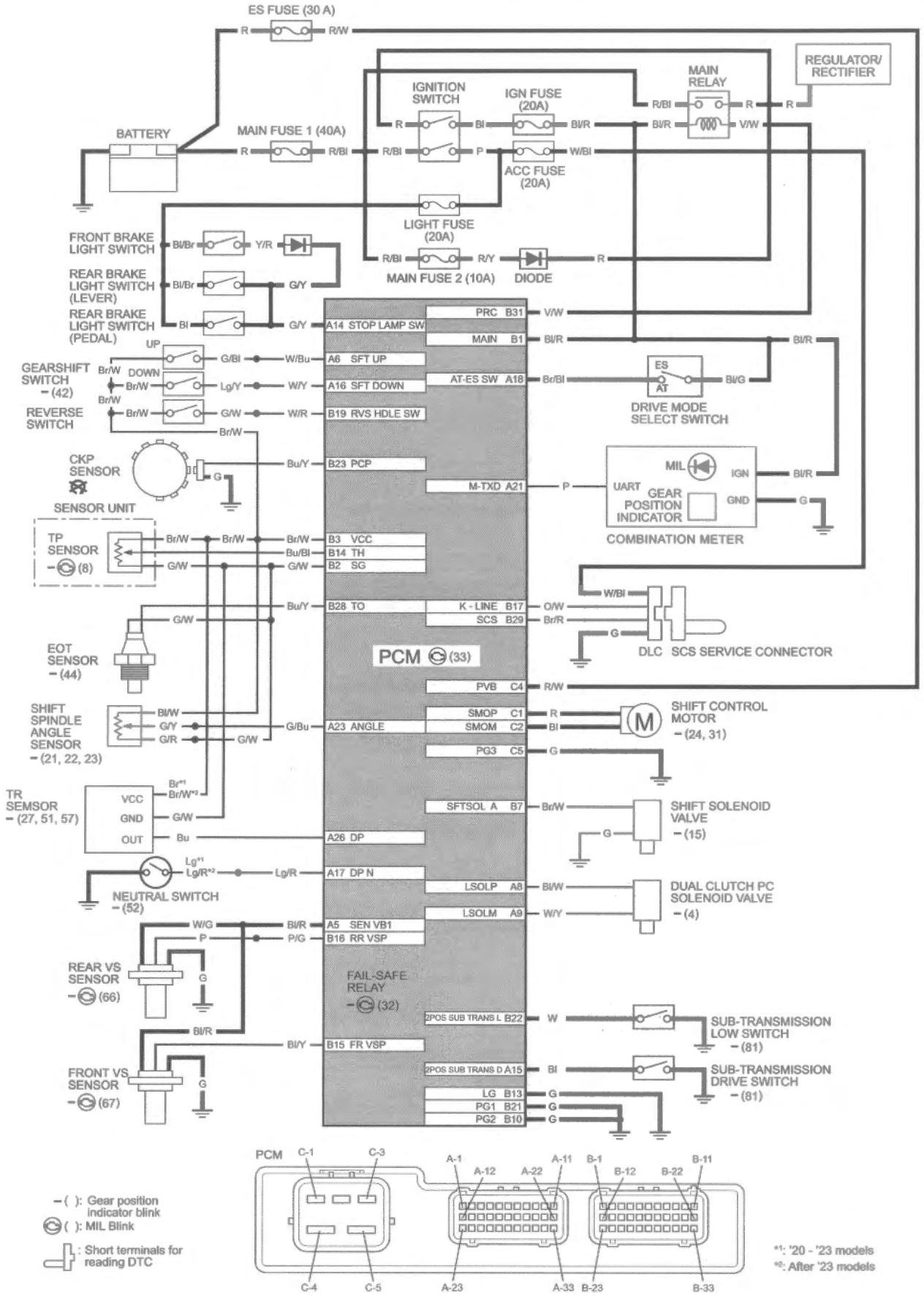


SYSTEM DIAGRAM

'15 – '19:



After '19:


ES FUSE (30 A)
REGULATOR/ RECTIFIER
MAIN RELAY
IGNITION SWITCH
IGN FUSE (20A)
BATTERY
MAIN FUSE 1 (40A)
ACC FUSE (20A)
LIGHT FUSE (20A)
FRONT BRAKE LIGHT SWITCH
REAR BRAKE LIGHT SWITCH (LEVER)
REAR BRAKE LIGHT SWITCH (PEDAL)
MAIN FUSE 2 (10A)
DIODE
GEARSHIFT SWITCH - (42)
REVERSE SWITCH
DRIVE MODE SELECT SWITCH
CKP SENSOR
SENSOR UNIT
COMBINATION METER
TP SENSOR - (8)
EOT SENSOR - (44)
DLC
SCS SERVICE CONNECTOR
PCM (33)
SHIFT SPINDLE ANGLE SENSOR - (21, 22, 23)
SHIFT CONTROL MOTOR - (24, 31)
TR SEMSOR - (27, 51, 57)
SHIFT SOLENOID VALVE - (15)
NEUTRAL SWITCH - (52)
DUAL CLUTCH PC SOLENOID VALVE - (4)
REAR VS SENSOR - (66)
FAIL-SAFE RELAY - (32)
SUB-TRANSMISSION LOW SWITCH - (81)
FRONT VS SENSOR - (67)
SUB-TRANSMISSION DRIVE SWITCH - (81)
PRC B31
MAIN B1
A14 STOP LAMP SW
A6 SFT UP
A16 SFT DOWN
AT-ES SW A18
B19 RVS HDLE SW
B23 PCP
M-TXD A21
B3 VCC
B14 TH
B2 SG
B28 TO
K - LINE B17
SCS B29
PVB C4
SMOP C1
SMOM C2
A23 ANGLE
PG3 C5
SFTSOL A B7
A26 DP
A17 DP N
LSOLP A8
LSOLM A9
A5 SEN VB1
B16 RR VSP
B15 FR VSP
2POS SUB TRANS L B22
2POS SUB TRANS D A15
LG B13
PG1 B21
PG2 B10
PCM C-1 C-3 C-4 C-5
A-1 A-12 A-22 A-23
A-11 A-33
B-1 B-12 B-22 B-23
B-11 B-33
-( ): Gear position indicator blink
( ): MIL Blink
: Short terminals for reading DTC
*1: '20 - '23 models
*2: After '23 models

TROUBLESHOOTING INFORMATION

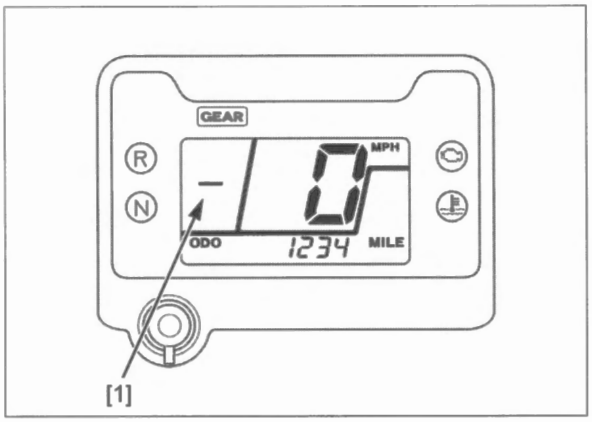
GENERAL TROUBLESHOOTING

Refer to the "GENERAL TROUBLESHOOTING" in "PGM-FI system" (page 4-12).

SYSTEM DESCRIPTION

SELF-DIAGNOSIS SYSTEM

The DCT system is equipped with the self-diagnostic system. When any abnormality occurs in the DCT system, the PCM have the gear position indicator [1] blinking "–" and stores a DTC in its erasable memory for the relevant system failure.



FAIL-SAFE FUNCTION

The DCT system is provided with a fail-safe function to secure a minimum running capability even when there is trouble in the system.

When the PCM detects a problem in the DCT system, the PCM stops the automatic shift and ESP functions, and defaults the transmission into the 2nd/4th/reverse gear position. Also, the gear position indicator blinks "–" to indicate the DTC.

INDICATOR BLINK PATTERN

- The number of indicator blinks is the equivalent the main code of the DTC (the sub code cannot be displayed by the indicator blinking).
- The indicator has two types of blinks, a long blink and short blink. The long blink lasts for 1.2 seconds, the short blink lasts for 0.4 seconds. One long blink is the equivalent of ten short blinks. For example, when one long blink is followed by five short blinks, the DTC is 15 (one long blink = 10 blinks, plus five short blinks).
- When the PCM stores more than one DTC, the indicator displays in the order from the lowest number to highest number.

CURRENT DTC/STORED DTC

The DTC is indicated in two ways according to the failure status.

- If the PCM detects the problem at present, the gear position indicator will blink at all times. It is possible to readout the indicator blink pattern as the current DTC.
- If the PCM does not detect any problem at present but has a problem stored in its memory, the indicator will not blink. If it is necessary to retrieve the past problem, readout the stored DTC by following the DTC readout procedure.

MCS INFORMATION

Refer to the "MCS INFORMATION" in "PGM-FI system" (page 4-13).

DTC READOUT

NOTE:

- If the MIL blinks, readout the DTC (page 4-13) and troubleshoot the PGM-FI system first. Then recheck the DCT system after erasing the PGM-FI DTC.
- After performing diagnostic troubleshooting, erase the problem code(s) (page 13-16) and test-drive the vehicle to be sure that the problem(s) have been removed.

If the gear position indicator blinks "–", connect the MCS to the DLC (page 4-13).

Read the DTC and stored data, and follow the troubleshooting index (page 13-17).

To read the DTC with the gear position indicator, use the following procedure.

Reading DTC with the gear position indicator

Turn the ignition switch ON and read "–" blinks on the gear position indicator. The number of blinks indicates the current DTC.

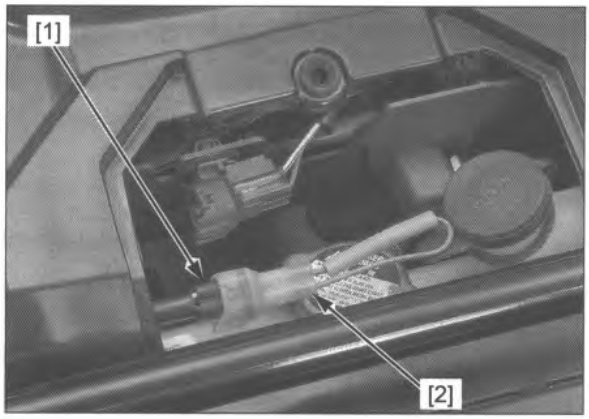
Refer to the troubleshooting index (page 13-17).

When retrieving the stored DTC, refer to the following procedures.

Remove the dummy connector (page 4-13).

Short the DLC [1] terminals using the special tool.

TOOL:
[2] SCS Service Connector 070PZ-ZY30100
CONNECTION: Brown/red – Green



Turn the ignition switch ON and read "–" blinks on the gear position indicator. The number of blinks indicates the stored DTC.

Refer to the troubleshooting index (page 13-17).

ERASING DTC

Connect the MCS to the DLC (page 4-13).

Erase the DTC with the MCS while the engine is stopped.

To erase the DTC without MCS, refer to the following procedure.

How to erase the DTC without MCS

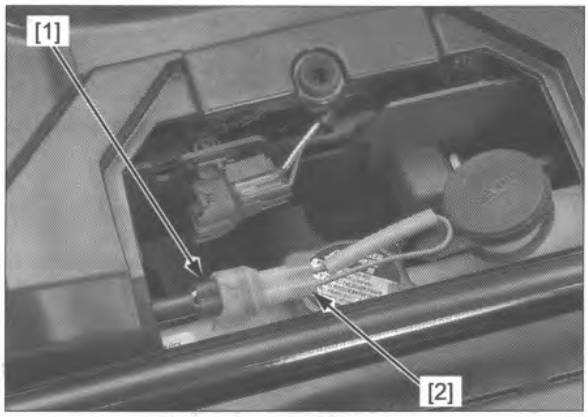
NOTE:

- When the DCT DTC is erased, the PGM-FI DTC would also be erased at the same time. Check the MIL blinks and troubleshoot the PGM-FI system before erasing the DCT DTC.

1. Turn the ignition switch OFF.
2. Remove the dummy connector (page 4-13).
3. Short the DLC [1] terminals using the special tool

   TOOL:
   [2] SCS Service Connector 070PZ-ZY30100

   Connection: Brown/red – Green



4. Turn the ignition switch ON.
5. Remove the special tool from the DLC.
6. The gear position indicator will show "–" for approximately 5 seconds. While the indicator shows "–", short the DLC terminals again with the special tool. The self-diagnostic memory is erased if the indicator starts blinking "–".

NOTE:

- The DLC must be jumped while the indicator shows "–". If not, the indicator will not start blinking.
- Note that the self-diagnostic memory cannot be erased if the ignition switch is turned OFF before the indicator starts blinking.

CIRCUIT INSPECTION

Refer to the "INSPECTION AT PCM/ECM CONNECTOR" information in "PGM-FI system" (page 4-14).

DTC INDEX

'15 – '19:

- When the gear position indicator shows "–" constantly, but no problem code is indicated and retrievable, refer to the symptom troubleshooting (page 13-6).

DTC ("–" blinks)	Function Failure	Symptom/Fail-safe Function	Refer to page	MIL blinks
4-1 (4)	Dual clutch PC solenoid valve Low input • Loose or poor contact of the dual clutch PC solenoid valve connector • Dual clutch PC solenoid valve or its circuit malfunction	• Gearshift function does not work (2nd, 4th or reverse gear only)	13-21	–
4-2 (4)	Dual clutch PC solenoid valve High input • Dual clutch PC solenoid valve or its circuit malfunction	• Gearshift function does not work (2nd, 4th or reverse gear only)	13-22	
4-3 (4)	Dual clutch PC solenoid valve drive circuit • Dual clutch PC solenoid valve or its circuit malfunction	• Gearshift function does not work (2nd, 4th or reverse gear only)	13-21	
8-1 (8)	TP sensor circuit Low voltage • TP sensor or its circuit malfunction • Loose or poor contact of the TP sensor connector	• Poor engine acceleration • Fail-safe value: 0° • Gearshift function does not work (2nd, 4th or reverse gear only)	4-25	8
8-2 (8)	TP sensor circuit High voltage • TP sensor or its circuit malfunction	• Poor engine acceleration • Fail-safe value: 0° • Gearshift function does not work (2nd, 4th or reverse gear only)	4-27	
15-1 (15)	Shift solenoid valve circuit • Loose or poor contact of the shift solenoid valve connector • Shift solenoid valve or its circuit malfunction	• Gearshift function does not work (2nd, 4th or reverse gear only)	13-23	–
21-1 (21)	Shift spindle angle sensor circuit Low voltage • Loose or poor contact of the shift spindle angle sensor connector • Shift spindle angle sensor or its circuit malfunction	• Gearshift function does not work (2nd, 4th or reverse gear only)	13-24	–
21-2 (21)	Shift spindle angle sensor circuit High voltage • Shift spindle angle sensor or its circuit malfunction	• Gearshift function does not work (2nd, 4th or reverse gear only)	13-25	–
22-1 (22)	Shift spindle operation malfunction (while operating gearshift mechanism) • Control motor or its circuit malfunction • Shift spindle angle sensor or its circuit malfunction	• Gearshift function does not work (2nd, 4th or reverse gear only)	13-26	–
23-1 (23)	Shift spindle operation malfunction (after operating gearshift mechanism) • Shift spindle angle sensor installation problem • Shift spindle angle sensor or its circuit malfunction	• Gearshift function does not work (2nd, 4th or reverse gear only)	13-27	–
24-1 (24)	Shift control motor drive circuit • Loose or poor contact of the shift control motor connector • Control motor or its circuit malfunction • Control motor drive circuit malfunction	• Gearshift function does not work (2nd, 4th or reverse gear only)	13-28	–
32-1 (32)	Fail-safe relay circuit • Fail-safe relay circuit malfunction	• Gearshift function does not work (2nd, 4th or reverse gear only)	13-31	–
41-1 (41)	Shift drum position switch circuit • Shift drum position switch or its circuit malfunction (Short)	• Gearshift function does not work (2nd, 4th or reverse gear only)	13-31	41

DTC ("–" blinks)	Function Failure	Symptom/Fail-safe Function	Refer to page	MIL blinks
42-1 (42)	Gearshift switch circuit • Gearshift switch or its circuit malfunction	• Gearshift function does not work (2nd, 4th or reverse gear only)	13-33	–
44-1 (44)	EOT sensor circuit low voltage (less than 0.08 V) • EOT sensor or its circuit malfunction	• Gearshift function does not work (2nd, 4th or reverse gear only) • Cooling fan turns on	13-34	44
44-2 (44)	EOT sensor circuit high voltage (more than 4.92 V) • Loose or poor contact of the EOT sensor connector • EOT sensor or its circuit malfunction	• Gearshift function does not work (2nd, 4th or reverse gear only) • Cooling fan turns on	13-35	
66-1 (66)	Rear VS sensor no signal • Loose or poor contact of the Rear VS sensor connector • Rear VS sensor or its circuit malfunction	• Gearshift function does not work (2nd, 4th or reverse gear only)	13-39	66
67-1 (67)	Front VS sensor no signal • Loose or poor contact of the Front VS sensor connector • Front VS sensor or its circuit malfunction	• Gearshift function does not work (2nd, 4th or reverse gear only)	13-42	67
81-1 (81)	Sub-transmission switches malfunction (Low and drive switches remain on simultaneously for more than 1.5 seconds) • Sub-transmission switch or its circuit malfunction	• Gearshift function does not work (2nd, 4th or reverse gear only)	14-15	–

After '19:

- When the gear position indicator shows "–" constantly, but no problem code is indicated and retrievable, refer to the symptom troubleshooting (page 13-6).

DTC ("–" blinks)	Function Failure	Symptom/Fail-safe Function	Refer to page
4-1 (4)	Dual clutch PC solenoid valve Low input • Loose or poor contact of the dual clutch PC solenoid valve connector • Dual clutch PC solenoid valve or its circuit malfunction	• Gearshift function does not work	13-21
4-2 (4)	Dual clutch PC solenoid valve High input • Dual clutch PC solenoid valve or its circuit malfunction	• Gearshift function does not work	13-22
4-3 (4)	Dual clutch PC solenoid valve drive circuit • Dual clutch PC solenoid valve or its circuit malfunction	• Gearshift function does not work	13-21
8-1 (8)	TP sensor circuit Low voltage • TP sensor or its circuit malfunction • Loose or poor contact of the TP sensor connector	• Poor engine acceleration • Gearshift function does not work	4-25
8-2 (8)	TP sensor circuit High voltage • TP sensor or its circuit malfunction	• Poor engine acceleration • Gearshift function does not work	4-27
15-1 (15)	Shift solenoid valve circuit • Loose or poor contact of the shift solenoid valve connector • Shift solenoid valve or its circuit malfunction	• Gearshift function does not work	13-23
21-1 (21)	Shift spindle angle sensor circuit Low voltage (less than 0.215 V) • Loose or poor contact of the shift spindle angle sensor connector • Shift spindle angle sensor or its circuit malfunction	• Gearshift function does not work	13-24
21-2 (21)	Shift spindle angle sensor circuit High voltage (more than 4.619 V) • Shift spindle angle sensor or its circuit malfunction	• Gearshift function does not work	13-25
22-1 (22)	Shift spindle operation malfunction (while operating gearshift mechanism) • Control motor or its circuit malfunction • Shift spindle angle sensor or its circuit malfunction	• Gearshift function does not work	13-26
23-1 (23)	Shift spindle operation malfunction (after operating gearshift mechanism) • Shift spindle angle sensor installation problem • Shift spindle angle sensor or its circuit malfunction	• Gearshift function does not work	13-27
24-1 (24)	Shift control motor drive circuit • Loose or poor contact of the shift control motor connector • Control motor or its circuit malfunction • Control motor drive circuit malfunction	• Gearshift function does not work	13-28
27-1 (27)	Shift drum position malfunction • TR sensor malfunction • Gearshift mechanism malfunction • Faulty PCM	• Gearshift function does not work	13-29
31-1 (31)	Shift control motor low voltage • Fail safe relay in the PCM • ES fuse (30 A) • Loose or poor contact of the PCM 33P (Gray) connector	• Gearshift function does not work (2nd gear only) • Creep cut does not work	13-31
32-1 (32)	Fail-safe relay circuit • Fail-safe relay circuit malfunction	• Gearshift function does not work	13-31
33-2 *	PCM EEPROM malfunction	• Does not hold and erase the self-diagnosis data.	4-37
42-1 (42)	Gearshift switch circuit • Gearshift switch or its circuit malfunction	• Gearshift function does not work	13-33
44-1 (44)	EOT sensor circuit low voltage (less than 0.059 V) • EOT sensor or its circuit malfunction	• Gearshift function works normally	13-34

DTC ("–" blinks)	Function Failure	Symptom/Fail-safe Function	Refer to page
44-2 (44)	EOT sensor circuit high voltage (more than 4.922 V) • Loose or poor contact of the EOT sensor connector • EOT sensor or its circuit malfunction	• Gearshift function works normally	13-35
51-1 (51)	TR sensor low voltage (less than 0.410 V) • Loose or poor contact of the TR sensor connector • TR sensor or its circuit malfunction	• Gearshift function does not work	13-36
51-2 (51)	TR sensor high voltage (more than 4.702 V) • TR sensor or its circuit malfunction	• Gearshift function does not work	13-38
52-1 (52)	Neutral switch stuck OFF • Loose or poor contact of the neutral switch connector • Neutral switch or its circuit malfunction	• Gearshift function does not work	13-38
52-2 (52)	Neutral switch stuck ON • Neutral switch or its circuit malfunction	• Gearshift function does not work	13-39
57-1 (57)	Gearshift mechanism malfunction • Gearshift mechanism malfunction • TR sensor or its circuit malfunction	• Gearshift function does not work	13-39
57-2 (57)	Gear position malfunction (jumps out of gear) • Gearshift mechanism malfunction • TR sensor or its circuit malfunction	• Gearshift function does not work	13-39
66-1 (66)	Rear VS sensor no signal • Loose or poor contact of the Rear VS sensor connector • Rear VS sensor or its circuit malfunction	• Gearshift function does not work	13-39
67-1 (67)	Front VS sensor no signal • Loose or poor contact of the Front VS sensor connector • Front VS sensor or its circuit malfunction	• Gearshift function does not work	13-42
81-1 (81)	Sub-transmission switches malfunction (Low and drive switches remain on simultaneously for more than 1.5 seconds) • Sub-transmission switch or its circuit malfunction	• Gearshift function does not work	14-15

* DTC can be readout/erased only by MCS.

DTC TROUBLESHOOTING

NOTE:

- Perform inspection with the ignition switch turned OFF, unless otherwise specified.
- After troubleshooting, erase the DTC (page 13-16) and test-ride the vehicle to be sure that the system is normal.

DTC 4-1 (DUAL CLUTCH PC SOLENOID LOW INPUT), DTC 4-3 (DUAL CLUTCH PC SOLENOID DRIVE CIRCUIT)

- Before starting the troubleshooting, check the dual clutch PC solenoid valve 2P connector for loose or poor contacts, and recheck the DTC.

1. **Recheck DTC**

   Recheck the current DTC with the MCS.

   Is DTC 4-1 or 4-3 indicated?

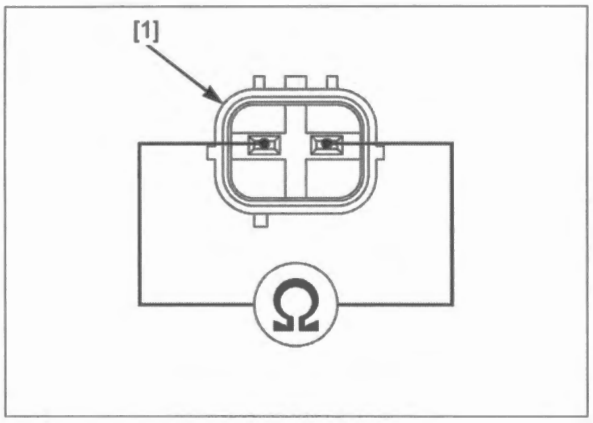
   YES – GO TO STEP 2.

   NO – Intermittent failure

2. **Dual Clutch PC Solenoid Inspection**

   Turn the ignition switch OFF.
   Disconnect the dual clutch PC solenoid valve 2P connector (page 13-6).
   Measure the resistance between the solenoid valve side 2P connector [1] terminals.

   Standard: 5.1 – 5.7 Ω (20°C/68°F)

   Is the resistance within standard value?

   YES – GO TO STEP 3.

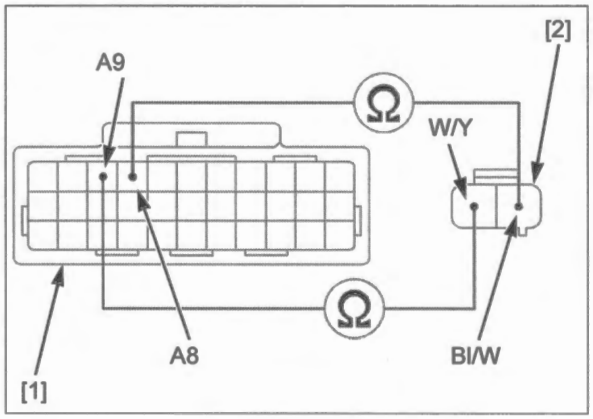
   NO – Faulty dual clutch PC solenoid valve

3. **Dual Clutch PC Solenoid Valve Line Open Circuit Inspection**

   Disconnect the PCM 33P (Black) connector (page 4-45).
   Check for continuity between the wire harness side 33P (Black) connector [1] and 2P connector [2] terminals.

   TOOL:
   Pin Probe Male (2 pack) **07ZAJ-RDJA110**

   Connection: A8 – Black/white
   A9 – White/yellow

   Is there continuity?

   YES – GO TO STEP 4.

   NO – • Open circuit in the Black/white wire
   • Open circuit in the White/yellow wire

4. **Recheck DTC**

   Connect the dual clutch PC solenoid valve 2P connector and PCM 33P (Black) connector.
   Recheck the current DTC with the MCS.

   Is DTC 4-1 or 4-3 indicated?

   YES – Replace the PCM with a known good one (page 4-45) and recheck.

   NO – Intermittent failure

DTC 4-2 (DUAL CLUTCH PC SOLENOID HIGH INPUT)

1. **Recheck DTC**

   Recheck the current DTC with the MCS.

   Is DTC 4-2 indicated?

   YES – GO TO STEP 2.

   NO – Intermittent failure

2. **Dual Clutch PC Solenoid Valve Inspection**

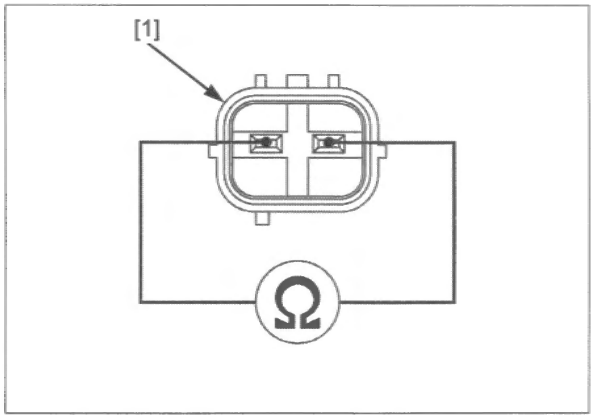
   Turn the ignition switch OFF.
   Disconnect the dual clutch PC solenoid valve 2P connector (page 13-6).
   Measure the resistance between the solenoid valve side 2P connector [1] terminals.

   Standard: 5.1 – 5.7 Ω (20°C/68°F)

   Is the resistance within 4.5 – 10.0 Ω?

   YES – GO TO STEP 3.

   NO – Faulty dual clutch PC solenoid valve



3. **Dual Clutch PC Solenoid Valve Line Short Circuit Inspection**

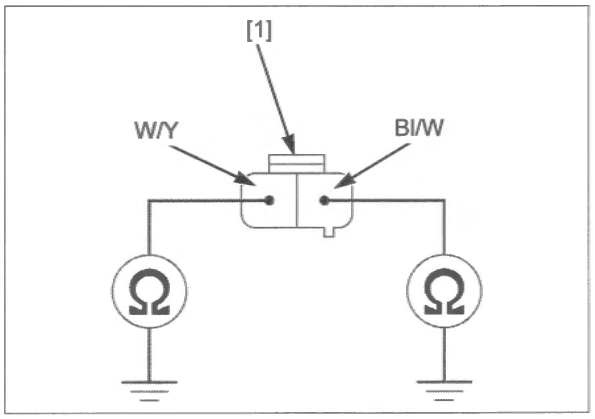
   Disconnect the PCM 33P (Black) connector (page 4-45).
   Check the for continuity between the wire harness side 2P connector [1] terminal and ground.

   Connection: Black/white – ground
   White/yellow – ground

   Is there continuity?

   YES – • Short circuit in the Black/white wire
   • Short circuit in White/yellow wire

   NO – GO TO STEP 4.



4. **Recheck DTC**

   Connect the dual clutch PC solenoid valve 2P connector and PCM 33P (Black) connector.
   Recheck the current DTC with the MCS.

   Is DTC 4-2 indicated?

   YES – Replace the PCM with a known good one (page 4-45) and recheck.

   NO – Intermittent failure

DTC 15-1 (SHIFT SOLENOID VALVE CIRCUIT)

- Before starting the troubleshooting, check the shift solenoid valve 2P connector for loose or poor contacts, and recheck the DTC.

1. **Recheck DTC**

   Recheck the current DTC with the MCS.

   Is DTC 15-1 indicated?

   YES – GO TO STEP 2.

   NO – Intermittent failure

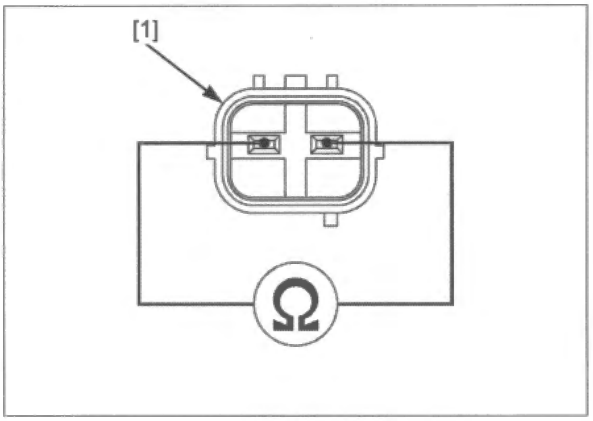
2. **Shift Solenoid Valve Inspection**

   Turn the ignition switch OFF.
   Disconnect the shift solenoid valve 2P connector (page 13-57).
   Measure the resistance between the solenoid valve side 2P connector [1] terminals.

   Is the resistance within 14.6 – 16.2 Ω (20°C/68°F)?

   YES – GO TO STEP 3.

   NO – Faulty shift solenoid valve



3. **Shift Solenoid Valve Line Open Circuit Inspection**

   Disconnect the PCM 33P (Gray) connector (page 4-45).
   Check for continuity between the wire harness side 33P (Gray) connector [1] and 2P connector [2] terminals, and between the 2P connector terminal and ground.

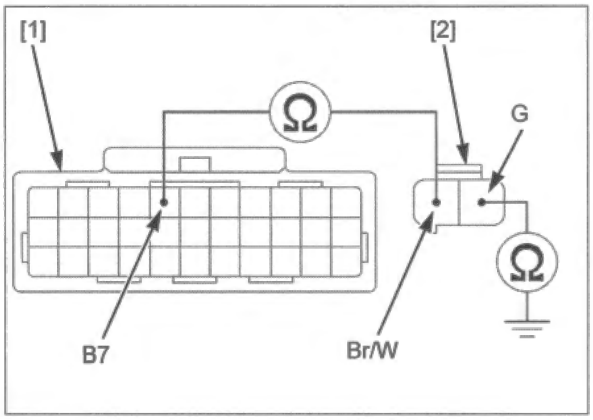
   TOOL:
   Pin Probe Male (2 pack) **07ZAJ-RDJA110**

   Connection: B7 – Brown/white
   Green – ground

   Is there continuity?

   YES – GO TO STEP 4.

   NO – • Open circuit in the Brown/white wire
   • Open circuit in the Green wire



4. **Shift Solenoid Valve Line Short Circuit Inspection**

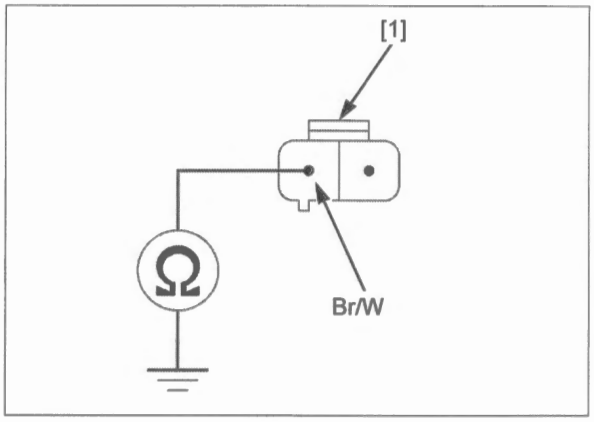
   Check for continuity between the wire harness side 2P connector [1] terminal and ground.

   Connection: Brown/white – ground

   Is there continuity?

   YES – Short circuit in the Brown/white wire

   NO – GO TO STEP 5.



5. **Recheck DTC**

   Connect the shift solenoid valve 2P connector and PCM 33P (Gray) connector.
   Recheck the current DTC with the MCS.

   Is DTC 15-1 indicated?

   YES – Replace the PCM with a known good one (page 4-45) and recheck.

   NO – Intermittent failure

DTC 21-1 (SHIFT SPINDLE ANGLE SENSOR LOW VOLTAGE)

- Before starting the troubleshooting, check the shift spindle angle sensor 3P (Gray) connector and engine sub-wire harness 3P (Black) connector for loose contacts or corroded terminals, and recheck the DTC.

1. **Shift Spindle Angle Sensor System Inspection**

   Check the shift spindle angle sensor with the MCS.

   Is about 0 V indicated?

   YES – GO TO STEP 2.

   NO – Intermittent failure

2. **Shift Spindle Angle Sensor Input Voltage Inspection**

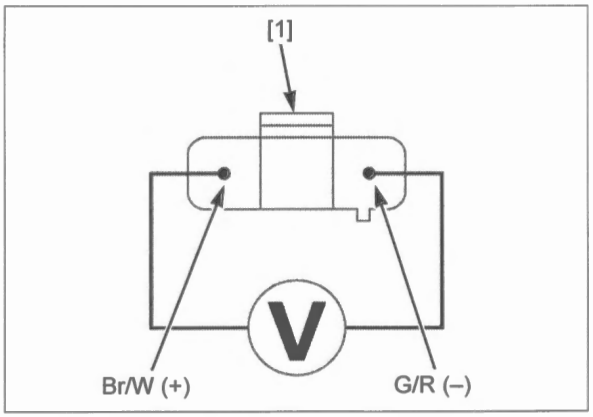
   Turn the ignition switch OFF.
   Disconnect the shift spindle angle sensor 3P (Gray) connector (page 13-57).
   Turn the ignition switch ON.
   Measure the voltage between the wire harness side 3P (Gray) connector [1] terminals.

   Connection: Brown/white (+) – Green/red (–)

   Is the voltage within 4.75 – 5.25 V?

   YES – GO TO STEP 3.

   NO – Replace the PCM with a known good one (page 4-45) and recheck.



3. **Shift Spindle Angle Sensor Output Line Short Circuit Inspection**

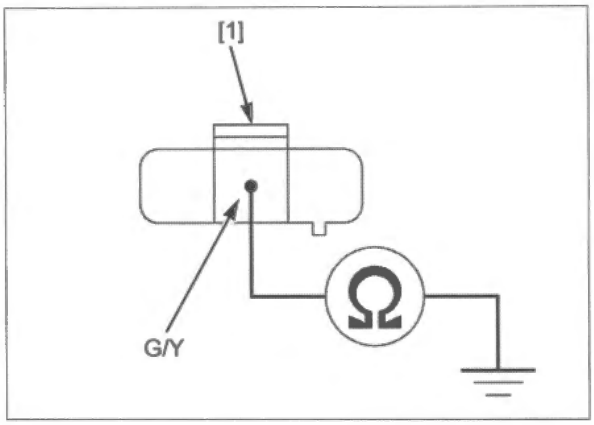
Check for continuity between the wire harness side 3P (Gray) connector [1] terminal and ground.

Connection: Green/yellow – ground

Is there continuity?

YES – Short circuit in the Green/yellow or Green/blue wire

NO – GO TO STEP 4.



4. **Shift Spindle Angle Sensor Inspection**

Replace the shift spindle angle sensor with a known good one (page 13-57).
Connect the shift spindle angle sensor 3P (Gray) connector and PCM 33P (Black) connector.
Turn the ignition switch ON.
Check the shift spindle angle sensor with the MCS.

Is about 0 V indicated?

YES – Replace the PCM with a known good one (page 4-45) and recheck.

NO – Faulty original shift spindle angle sensor

DTC 21-2 (SHIFT SPINDLE ANGLE SENSOR HIGH VOLTAGE)

1. **Shift Spindle Angle Sensor System Inspection**

Check the shift spindle angle sensor with the MCS.

Is about 5 V indicated?

YES – GO TO STEP 2.

NO – Intermittent failure

2. **Shift Spindle Angle Sensor Input Voltage Inspection**

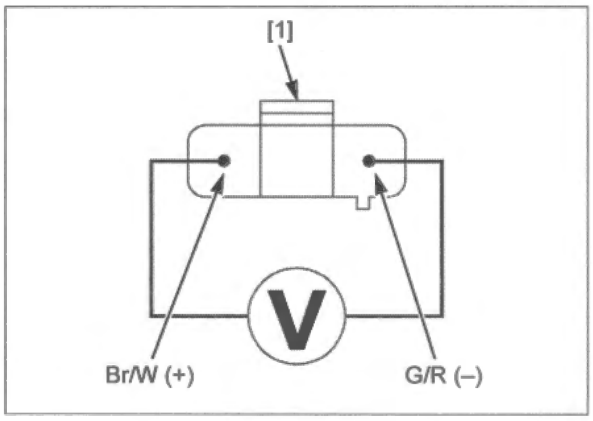
Turn the ignition switch OFF.
Disconnect the shift spindle angle sensor 3P (Gray) connector (page 13-57).
Turn the ignition switch ON.
Measure the voltage between the wire harness side 3P (Gray) connector [1] terminals.

Connection: Brown/white (+) – Green/red (–)

Is the voltage within 4.75 – 5.25 V?

YES – GO TO STEP 3.

NO – • Open circuit in the Brown/white wire
• Open circuit in the Green/red or Green/white wire



3. **Shift Spindle Angle Sensor Output Line Open Circuit Inspection**

Turn the ignition switch OFF.
Disconnect the PCM 33P (Black) connector (page 4-45).
Check for continuity between the wire harness side 33P (Black) connector [1] and 3P (Gray) connector [2] terminals.

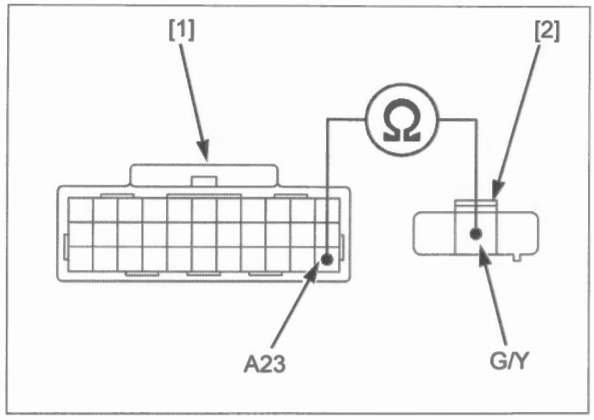
TOOL:
Pin Probe Male (2 pack) **07ZAJ-RDJA110**

Connection: A23 – Green/yellow

Is there continuity?

YES – GO TO STEP 4.

NO – Open circuit in the Green/yellow or Green/blue wire



4. **Shift Spindle Angle Sensor Inspection**

Replace the shift spindle angle sensor with a known good one (page 13-57).
Connect the shift spindle angle sensor 3P (Gray) connector and PCM 33P (Black) connector.
Turn the ignition switch ON.
Check the shift spindle angle sensor with the MCS.

Is about 5 V indicated?

YES – Replace the PCM with a known good one (page 4-45) and recheck.

NO – Faulty original shift spindle angle sensor

DTC 22-1 (SHIFT SPINDLE ANGLE SENSOR MALFUNCTION: While operating gearshift mechanism)

1. **Shift Spindle Angle Sensor System Inspection**

Check the shift spindle angle sensor with the MCS.

Is Low voltage (about 0 V) or High voltage (about 5 V) indicated?

YES – • About 0 V: See DTC 21-1 (page 13-24)
• About 5 V: See DTC 21-2 (page 13-25)

NO – GO TO STEP 2.

2. **Shift Control Motor/Reduction Gear Condition Inspection**

Turn the ignition switch OFF.
Check that the shift control motor and reduction gears are installed properly and are not damaged (page 13-59).

Are the shift control motor and reduction gears in normal condition?

YES – GO TO STEP 3.

NO – Install the shift control motor and reduction gears properly or replace faulty parts.

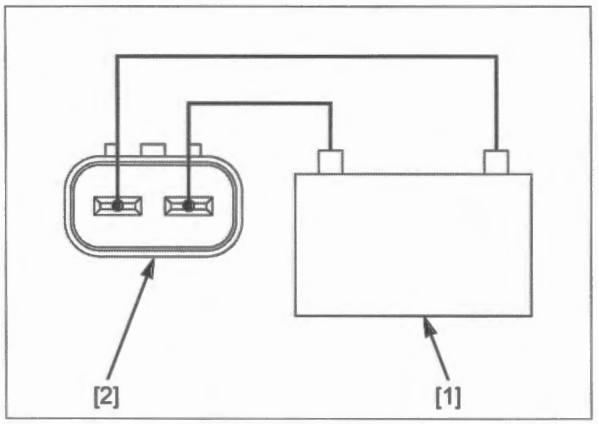
3. **Shift Control Motor Inspection**

   Remove the shift control motor (page 13-59).
   Connect a fully charged 12 V battery [1] to the control motor 2P connector [2] terminals to check the motor operation.
   Change the battery connection to check the reverse operation.

   Does the shift control motor turn in both direction?

   YES – GO TO STEP 4.

   NO – Faulty shift control motor



4. **Shift Spindle Angle Sensor System Inspection**

   Remove the shift spindle angle sensor with the connector connected.
   Turn the ignition switch ON.
   While turning the shift spindle angle sensor shaft, check the shift spindle angle sensor voltage with the MCS.

   When turning the sensor shaft clockwise:
   Voltage increase
   When turning the sensor shaft counterclockwise:
   Voltage decrease

   Does the voltage vary properly?

   YES – GO TO STEP 5.

   NO – Faulty shift spindle angle sensor

5. **Shift Spindle Angle Sensor Condition Inspection**

   Check that the shift spindle angle sensor is installed properly.

   Is the shift spindle angle sensor in normal condition?

   YES – GO TO STEP 6.

   NO – Install the shift spindle angle sensor properly.

6. **DTC Recheck**

   Recheck the DTC with the MCS.

   Is DTC 22-1 indicated?

   YES – Replace the PCM with a known good one (page 4-45) and recheck.

   NO – Intermittent failure

DTC 23-1 (SHIFT SPINDLE ANGLE SENSOR MALFUNCTION: After operating gearshift mechanism)

Refer to DTC 22-1 (page 13-26).

DTC 24-1 (SHIFT CONTROL MOTOR DRIVE CIRCUIT)

- Before starting the troubleshooting, check the shift control motor 2P connector for loose contacts or corroded terminals, and recheck the DTC.

1. PCM Motor Power Input Line Open Circuit Inspection

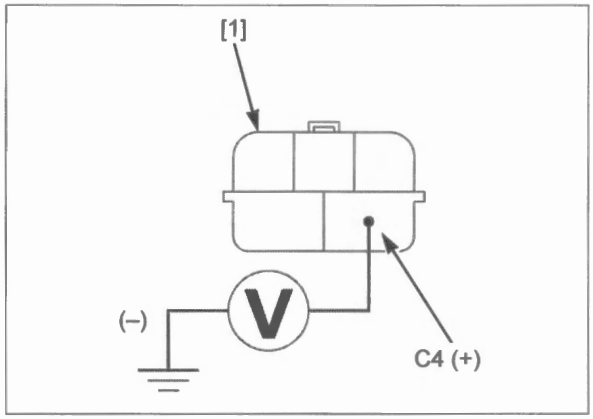
Disconnect the PCM 5P (Black) connector (page 4-45).
Measure the voltage between the wire harness side 5P (Black) connector [1] terminal and ground.

Connection: C4 (+) – ground (–)

Is there battery voltage?

YES – GO TO STEP 2.

NO – • Brown ES fuse (30 A)
• Open circuit in the Red or Red/white wire



2. PCM Motor Power Ground Line Open Circuit Inspection

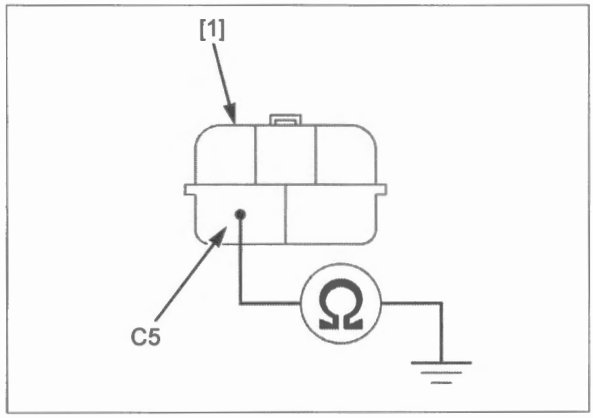
Check for continuity between the wire harness side 5P (Black) connector [1] terminal and ground.

Connection: C5 – ground

Is there continuity?

YES – GO TO STEP 3.

NO – Open circuit in the Green wire



3. Shift Control Motor Line Open Circuit Inspection

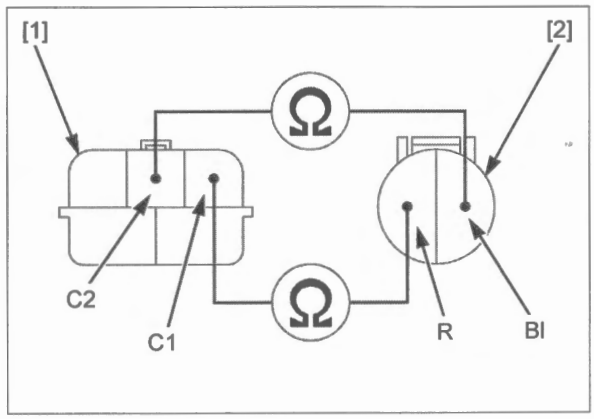
Disconnect the shift control motor 2P connector (page 13-59).
Check for continuity between the wire harness side 5P (Black) connector [1] and 2P connector [2] terminals.

Connection: C1 – Red
C2 – Black

Is there continuity?

YES – GO TO STEP 4.

NO – • Open circuit in the Red wire
• Open circuit in the Black wire



4. Shift Control Motor Line Short Circuit Inspection

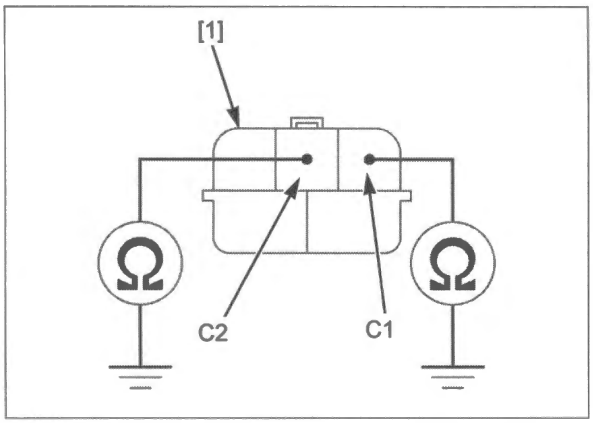
Check for continuity between the wire harness side 5P (Black) connector [1] terminals and ground.

Connection: C1 – ground
C2 – ground

Is there continuity?

YES – • Short circuit in the Red wire
• Short circuit in the Black wire

NO – GO TO STEP 5.



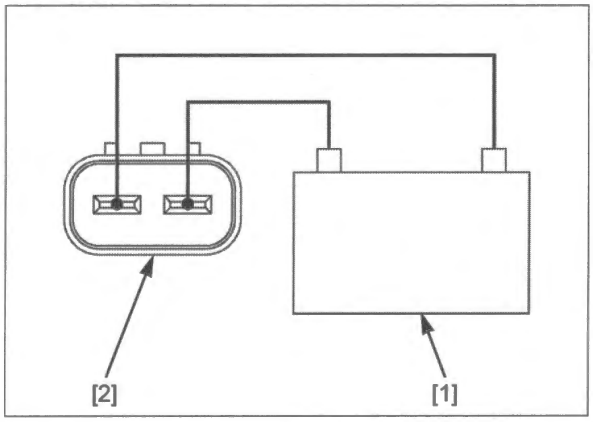
5. Shift Control Motor Inspection

Remove the shift control motor (page 13-59).
Connect a fully charged 12 V battery [1] to the control motor side 2P connector [2] terminals to check the motor operation.
Change the battery connection to check the reverse operation.

Does the shift control motor turn in both directions?

YES – GO TO STEP 6.

NO – Faulty shift control motor



6. Recheck DTC

Connect the PCM 5P (Black) connector and shift control motor 2P connector.
Recheck the current DTC with the MCS.

Is DTC 24-1 indicated?

YES – Replace the PCM with a known good one (page 4-45) and recheck. If DTC 24-1 is indicated again, replace the control motor.

NO – Intermittent failure

DTC 27-1 (SHIFT DRUM POSITION MALFUNCTION) (After '19)

1. TR Sensor System Inspection

Check the TR sensor with the MCS.

Is Low voltage (about 0 V) or High voltage (about 5 V) indicated?

YES – • About 0 V: See DTC 51-1 (page 13-36).
• About 5 V: See DTC 51-2 (page 13-38).

NO – GO TO STEP 2.

2. **Shift Control Motor/Reduction gear condition**

   Check the shift control motor and reduction gears are installed properly and are not damaged.

   Are the shift control motor and reduction gears in normal condition?

   YES – GO TO STEP 3.

   NO – Install the shift control motor and reduction gears properly or replace faulty parts.

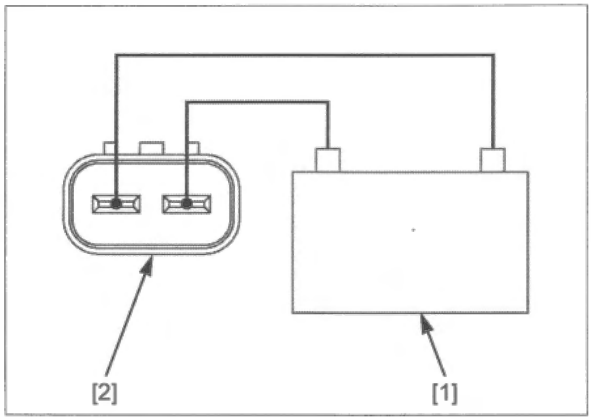
3. **Shift Control Motor Condition Inspection**

   Remove the shift control motor (page 13-59).
   Connect a fully charged 12 V battery [1] to the control motor [2] 2P connector terminals to check the motor operation.
   Change the battery connection to check the reverse operation.

   Does the shift control motor turn in both directions?

   YES – GO TO STEP 4.

   NO – Faulty shift control motor



4. **TR Sensor System Inspection**

   Remove the TR sensor with the connector connected (page 13-59).
   Turn the ignition switch ON.
   While turning the TR sensor shaft, check the TR sensor voltage with the MCS.

   When turning the sensor shaft clockwise:
   Voltage increase
   When turning the sensor shaft counterclockwise:
   Voltage decrease

   Does the voltage vary properly?

   YES – GO TO STEP 5.

   NO – Faulty TR sensor

5. **TR Sensor Condition Inspection**

   Check that the TR sensor is installed properly and is not damaged.

   Is the TR sensor in normal condition?

   YES – GO TO STEP 6.

   NO – Install the TR sensor properly.

6. **DTC Recheck**

   Recheck the DTC with the MCS.

   Is DTC 27-1 indicated?

   YES – Replace the PCM with a known good one, and recheck.

   NO – Intermittent failure

DTC 31-1 (SHIFT CONTROL MOTOR LOW VOLTAGE) (After '19)

NOTE:

- Before starting the inspection, check for loose or poor contact on the shift control motor 2P (Black) and PCM 5P (Black) connectors, and recheck the DTC.

1. **DTC Recheck**

   Erase the DTCs (page 13-16).
   Check the DTC with the MCS.

   Is DTC 32-1 indicated?

   YES – DTC 32-1 indicated (page 13-31).

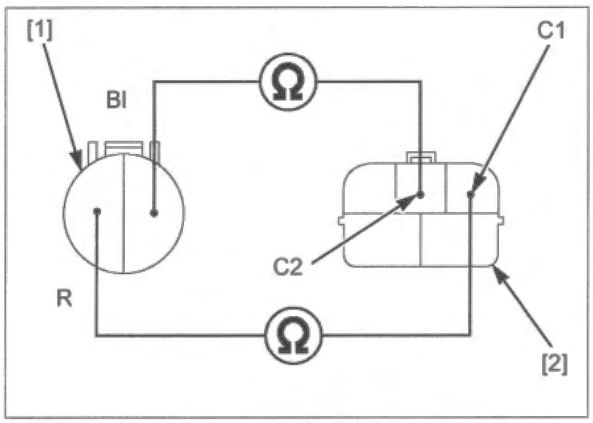
   NO – GO TO STEP 2.

2. **Shift Control Motor Line Open Circuit Inspection**

   Disconnect the PCM 5P (Black) connector and shift control motor 2P (Black) connector.
   Check for continuity between the wire harness side shift control motor 2P (Black) connector [1] and PCM 5P (Black) connector [2] terminals.

   Connection: Red – C1
   Black – C2

   TOOL:
   Test probe **07ZAJ-RDJA110**

   Is there continuity?

   YES – Replace the PCM with a known good one, and recheck.

   NO – • Open circuit in the Red wire
   • Open circuit in the Black wire

DTC 32-1 (FAIL SAFE RELAY CIRCUIT)

1. **Recheck DTC**

   Erase the DTC (page 13-16).
   Recheck the current DTC with the MCS.

   Is DTC 32-1 indicated?

   YES – Replace the PCM with a known good one (page 4-45) and recheck. If DTC 32-1 is indicated again, perform the following troubleshooting;
   – DTC 21-1 (page 13-24)
   – DTC 21-2 (page 13-25)
   – DTC 22-1 (page 13-26)
   – DTC 23-1 (page 13-27)
   – DTC 24-1 (page 13-28)

   NO – Intermittent failure

DTC 41-1 (SHIFT DRUM POSITION SWITCH CIRCUIT) ('15 – '19)

1. **Recheck DTC**

   Recheck the current DTC with the MCS.

   Is DTC 41-1 indicated?

   YES – GO TO STEP 2.

   NO – Intermittent failure.

2. **Shift Drum Position Switch Inspection at PCM Connector**

   Check the shift drum position switch for short circuit at the PCM 33P (Black) connector (page 13-62).

   Are the test results normal?

   YES – GO TO STEP 4.

   NO – GO TO STEP 3.

3. **Shift Drum Position Switch Inspection at Switch Connector**

   Check the shift drum position switch for short circuit at the shift drum position switch 10P (Gray) connector (page 13-62).

   Are the test results normal?

   YES –
   - Short circuit in the Gray wire
   - Short circuit in the Light green/red wire
   - Short circuit in the White/green wire
   - Short circuit in the Blue/black wire
   - Short circuit in the Yellow wire
   - Short circuit in the Blue/red wire
   - Short circuit in the Blue/white wire
   - Short circuit in the Blue/green wire
   - Short circuit in the Blue wire
   - Short circuit in the Light blue wire

   NO – Faulty shift drum position switch

4. **Recheck DTC**

   Connect the PCM 33P (Black) connector and shift drum position switch 10P (Gray) connector.
   Erase the DTC (page 13-16).
   Recheck the DTC with the MCS.

   Is DTC 41-1 indicated?

   YES – Replace the PCM with a new one and recheck.

   NO – Intermittent failure

DTC 42-1 (GEARSHIFT SWITCH CIRCUIT)

- Before starting the troubleshooting, check the handlebar switch 14P (Gray) connector for loose contacts or corroded terminals, and recheck the DTC.

1. Shift Switch Status Inspection

Check the shift switch status and voltage in the Data List Menu of MCS as follows:

'14 –'19

	UP	DOWN
"Up" ON	3.64 – 4.08 V	1.76 – 2.09 V
"Down" ON	1.76 – 2.09 V	3.64 – 4.08 V
Both ON	4.0 – 4.99 V	4.0 – 4.99 V
Both OFF	0 – 0.99 V	0 – 0.99 V

After '19

	UP	DOWN
"Up" ON	2.78 – 4.10 V	0.70 – 2.25 V
"Down" ON	0.70 – 2.25 V	2.78 – 4.10 V
Both ON	3.17 – 4.32 V	3.17 – 4.32 V
Both OFF	0 – 0.41 V	0 – 0.41 V

Is the shift switch status normal?

YES – Intermittent failure

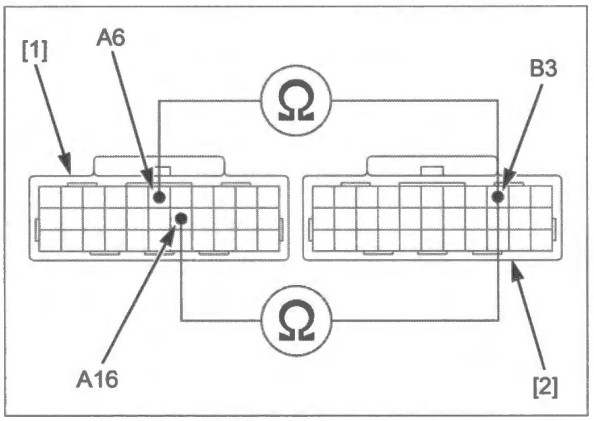
NO – GO TO STEP 2.

2. Shift Switch Inspection at PCM connector

Turn the ignition switch OFF.
Disconnect the PCM 33P connectors (page 4-45).
Check for continuity between the wire harness side 33P (Black) connector [1] and (Gray) connector [2] terminals while pushing each switch.

TOOL:
Pin Probe Male (2 pack) **07ZAJ-RDJA110**

Connection:
With the upshift switch pushed:
A6 – B3
With the downshift switch pushed:
A16 – B3



Is there continuity?

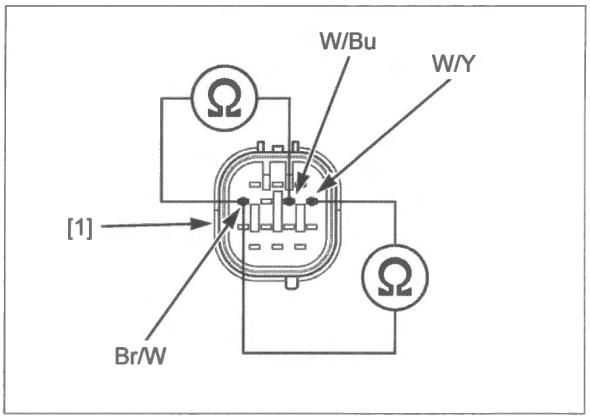
YES – GO TO STEP 4.

NO – GO TO STEP 3.

3. **Gearshift Switch Inspection at Handlebar Switch Connector**

Remove the left handlebar switch 14P (Gray) connector from the frame and disconnect it (page 24-15).
Check for continuity between the switch side 14P (Gray) connector [1] terminals while pushing each switch.

Connection:
With the upshift switch pushed
Brown/white – White/blue
With the downshift switch pushed
Brown/white – White/yellow



Is there continuity?

YES – Open circuit in the following wire between the PCM and handlebar switch connectors:
- Brown/white wire
- White/blue wire
- White/yellow wire

NO – Faulty gearshift switch (Replace the handlebar switch.)

4. **Recheck DTC**

Connect the PCM 33P (Black) connector and handlebar switch 14P (Gray) connector.
Recheck the current DTC with the MCS.

Is DTC 42-1 indicated?

YES – Replace the PCM with a known good one (page 4-45) and recheck.

NO – Intermittent failure

DTC 44-1 (EOT SENSOR LOW VOLTAGE)

1. **EOT Sensor System Inspection**

Check the EOT sensor with the MCS.

Is about 0 V indicated?

YES – GO TO STEP 2.

NO – Intermittent failure

2. **EOT Sensor Inspection**

Turn the ignition switch OFF.
Disconnect the EOT sensor 2P connector (page 13-65).
Turn the ignition switch ON.
Check the EOT sensor with the MCS.

Is about 0 V indicated?

YES – GO TO STEP 4.

NO – GO TO STEP 3.

3. **EOT Sensor Resistance Inspection**

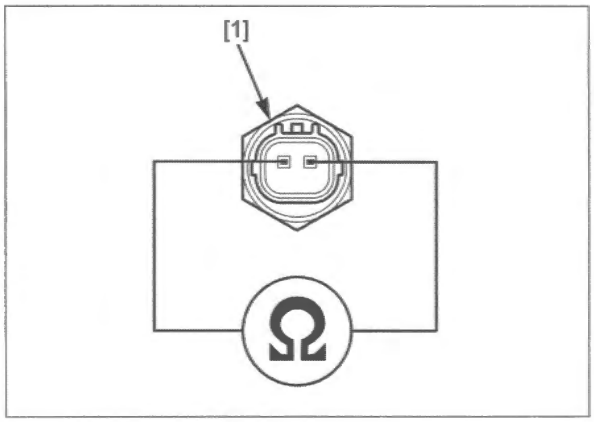
Turn the ignition switch OFF.
Measure the resistance between the sensor side 2P connector [1] terminals.

Standard: 2.3 – 2.6 kΩ (20°C/68°F)

Is the resistance within standard value?

YES – Replace the PCM with a known good one (page 4-45) and recheck.

NO – Faulty EOT sensor



4. **EOT Sensor Short Circuit Inspection**

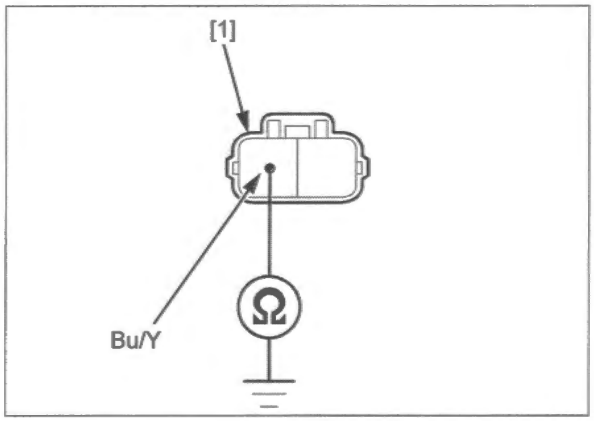
Disconnect the PCM 33P (Gray) connector (page 4-45).
Check for continuity between the wire harness side 2P connector [1] terminal and ground.

Connection: Blue/yellow – Ground

Is there continuity?

YES – Short circuit in the Blue/yellow wire

NO – Replace the PCM with a known good one (page 4-45) and recheck.



DTC 44-2 (EOT SENSOR HIGH VOLTAGE)

- Before starting the troubleshooting, check the EOT sensor 2P connector for loose contacts or corroded terminals, and recheck the DTC.

1. **EOT Sensor System Inspection**

Check the EOT sensor with the MCS.

Is about 5 V indicated?

YES – GO TO STEP 2.

NO – Intermittent failure

2. **EOT Sensor Inspection**

Turn the ignition switch OFF.
Disconnect the EOT sensor 2P connector (page 13-65).
Connect the wire harness side 2P connector [1] terminals with a jumper wire [2].

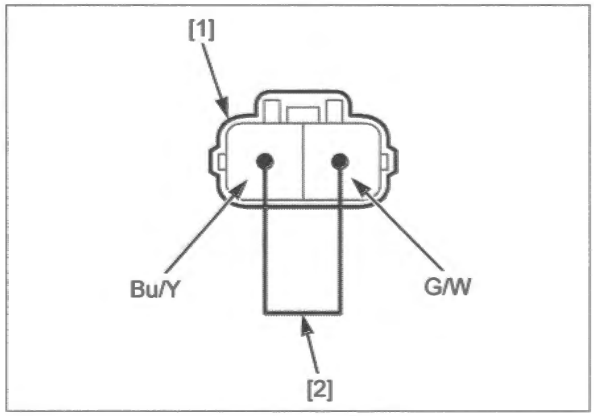
Connection: Blue/yellow – Green/white

Turn the ignition switch ON.
Check the EOT sensor with the MCS.

Is about 0 V indicated?

YES – Faulty EOT sensor

NO – GO TO STEP 3.



3. EOT Sensor Line Open Circuit Inspection

Turn the ignition switch OFF.
Remove the jumper wire.
Disconnect the PCM 33P (Gray) connector (page 4-45).
Check for continuity between the wire harness side 2P connector [1] and 33P (Gray) connector [2] terminals.

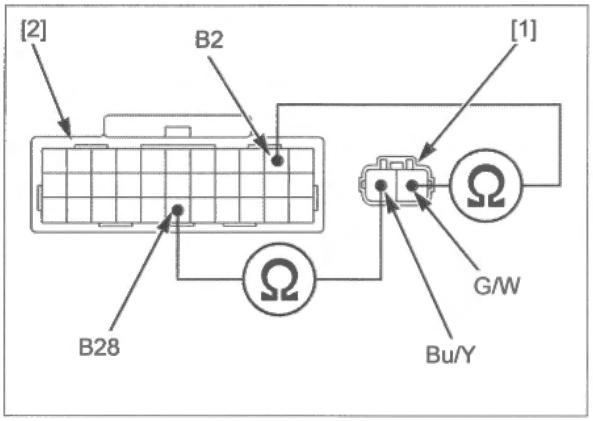
TOOL:
Pin Probe Male (2 pack) 07ZAJ-RDJA110

Connection: B28 – Blue/yellow
B2 – Green/white

Is there continuity?

YES – Replace the PCM with a known good one (page 4-45) and recheck.

NO – • Open circuit in the Blue/yellow wire
• Open circuit in the Green/white wire



DTC 51-1 (TR SENSOR LOW VOLTAGE) (After '19)

- Before starting the inspection, check for loose or poor contact of the TR sensor 8P (Black) and PCM 33P connectors, and recheck the DTC.

1. TR Sensor System Inspection

Check the TR sensor with the MCS.

Is about 0 V indicated?

YES – GO TO STEP 2.

NO – Intermittent failure

2. TR Sensor Input Voltage Inspection

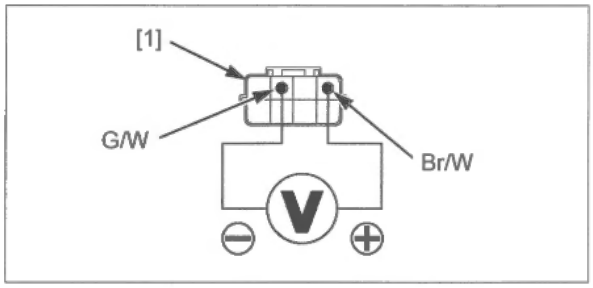
Turn the ignition switch OFF.
Disconnect the TR sensor 8P (Black) connector (page 13-58).
Turn the ignition switch ON.
Measure the voltage at the wire harness side 8P (Black) connector [1].

Connection: Brown/white (+) – Green/white (–)

Is the voltage within 4.75 – 5.25 V?

YES – GO TO STEP 5.

NO – GO TO STEP 3.



3. TR Sensor Input Line Open Circuit Inspection

Turn the ignition switch OFF.
Disconnect the PCM 33P (Gray) connector (page 4-45).
Check for continuity between the wire harness side 33P (Gray) connector [1] and 8P (Black) connector [2].

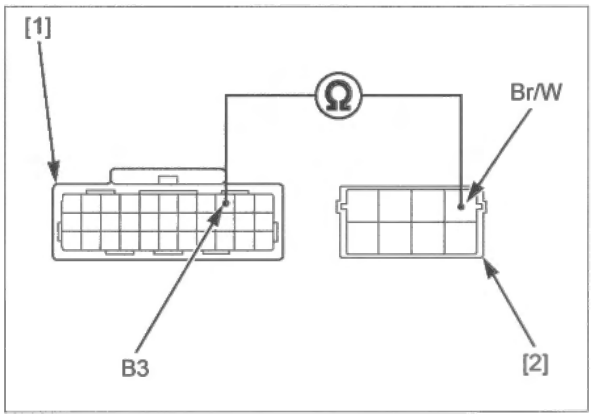
TOOL:
Test probe, 2 packs 07ZAJ-RDJA110

Connection: B3 – Brown/white

Is there continuity?

YES – GO TO STEP 4.

NO – Open circuit in the Brown/white wire



4. TR Sensor Ground Line Open Circuit Inspection

Check for continuity between the wire harness side 33P (Gray) connector [1] and 8P (Black) connector [2].

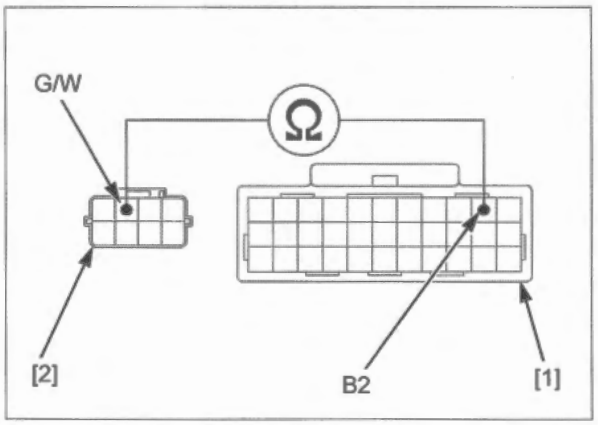
TOOL:
Test probe, 2 packs 07ZAJ-RDJA110

Connection: B2 – Green/white

Is there continuity?

YES – Replace the PCM with a known good one (page 4-45) and recheck.

NO – Open circuit in the Green/white wire



5. TR Sensor Signal Line Open Circuit Inspection

Turn the ignition switch OFF.
Disconnect the PCM 33P (Black) connector (page 4-45).
Check for continuity between the wire harness side 33P (Black) connector [1] and 8P (Black) connector [2].

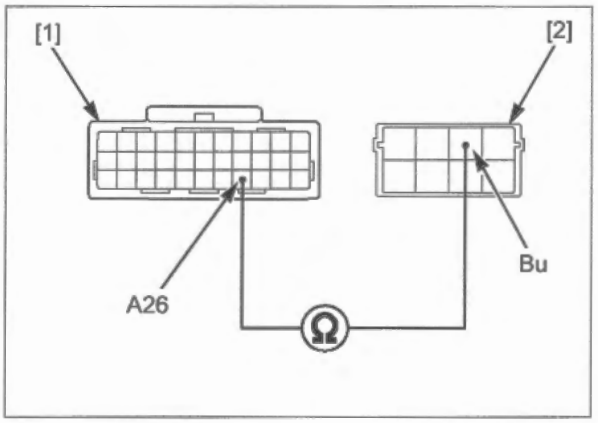
TOOL:
Test probe, 2 packs 07ZAJ-RDJA110

Connection: A26 – Blue

Is there continuity?

YES – GO TO STEP 6.

NO – Open circuit in the Blue wire



6. TR Sensor Output Line Short Circuit Inspection

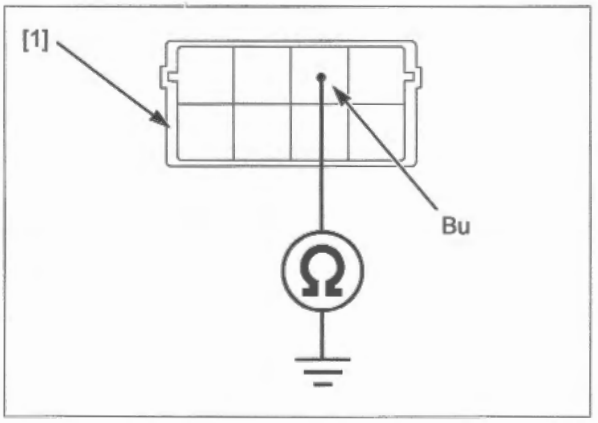
Check for continuity between the wire harness side 8P (Black) connector [1] and ground.

Connection: Blue – ground

Is there continuity?

YES – Short circuit in the Blue wire

NO – GO TO STEP 7.



7. TR Sensor Inspection

Replace the TR sensor with a known good one (page 13-58).
Connect the 8P (Black) connector and 33P (Black) connector.
Check the TR sensor with the MCS.

Is about 0 V indicated?

YES – Replace the PCM with a known good one (page 4-45) and recheck.

NO – Faulty original TR sensor

DTC 51-2 (TR SENSOR HIGH VOLTAGE) (After '19)

1. **TR Sensor System Inspection**

   Check the TR sensor with the MCS.

   Is about 5 V indicated?

   YES – GO TO STEP 2.

   NO – Intermittent failure

2. **TR Sensor Inspection**

   Replace the TR sensor with a known good one (page 13-58).
   Turn the ignition switch ON (I).
   Check the TR sensor with the MCS.

   Is about 5 V indicated?

   YES – Replace the PCM with a known good one (page 4-45) and recheck.

   NO – Faulty original TR sensor

DTC 52-1 (NEUTRAL SWITCH STUCK OFF) (After '19)

NOTE:

- Before starting the inspection, check for loose or poor contact on the neutral switch and PCM 33P (Black) connector, and recheck the DTC.

1. **DTC Recheck**

   Recheck the DTC with the MCS.

   Is DTC 52-1 indicated?

   YES – GO TO STEP 2.

   NO – Intermittent failure

2. **Neutral Switch Line Open Circuit Inspection**

   Turn the ignition switch OFF.
   Disconnect the PCM 33P (Black) connector and neutral switch connector.
   Check for continuity between the wire harness side PCM 33P (Black) connector [1] and neutral switch connector [2] terminals.

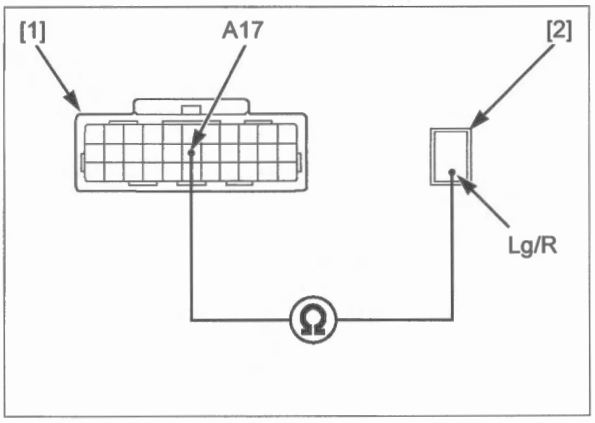
   Connection: A17 – Light green/red

   TOOL:
   Test probe **07ZAJ-RDJA110**

   Is there continuity?

   YES – GO TO STEP 3.

   NO – Open circuit in the Light green/red wire



3. **Neutral Switch Inspection**

   Replace the neutral switch with a known good one (page 13-58).
   Connect the PCM 33P (Black) connector and neutral switch connector.
   Turn the ignition switch ON.
   Recheck the DTC with the MCS.

   Is DTC 52-1 indicated?

   YES – Replace the PCM with a known good one, and recheck.

   NO – Faulty original neutral switch

DTC 52-2 (NEUTRAL SWITCH STUCK ON) (After '19)

1. **Neutral Switch Line Short Circuit Inspection**

   Disconnect the neutral switch connector.
   Check for continuity between the neutral switch connector terminal and ground.

   Connection: Light green/red – Ground

   Is there continuity?

   YES – Short circuit in the Light green/red wire.

   NO – GO TO STEP 2.

2. **Neutral Switch Inspection**

   Replace the neutral switch with a known good one (page 13-58).
   Connect the neutral switch connector.
   Check the DTC with the MCS.

   Is DTC 52-2 indicated?

   YES – Replace the PCM with a known good one, and recheck.

   NO – Faulty original neutral switch

DTC 57-1 (GEARSHIFT MECHANISM MALFUNCTION) (After '19)

See DTC 27-1 (page 13-29).

DTC 57-2 (GEAR POSITION MALFUNCTION; JUMPS OUT OF GEAR) (After '19)

See DTC 27-1 (page 13-29).

DTC 66-1 (REAR VS SENSOR NO SIGNAL)

- Before starting the troubleshooting, check the rear VS sensor 3P (Black) connector for loose or poor contacts, and recheck the DTC.

1. **Rear VS Sensor System Check**

   Erase the DTC (page 13-16).
   Test-drive the vehicle and stop the engine.
   Check the rear VS sensor signal with the MCS.

   Is the VS sensor signal indicated normally?

   YES – Intermittent failure.

   NO – GO TO STEP 2.

2. Rear VS Sensor Power Input Voltage Inspection

Turn the ignition switch OFF.
Disconnect the rear VS sensor 3P (Black) connector (page 13-65).
Turn the ignition switch ON.

'14 – '21 models: Measure the voltage between the wire harness side 3P (Black) connector [1] terminal and ground.

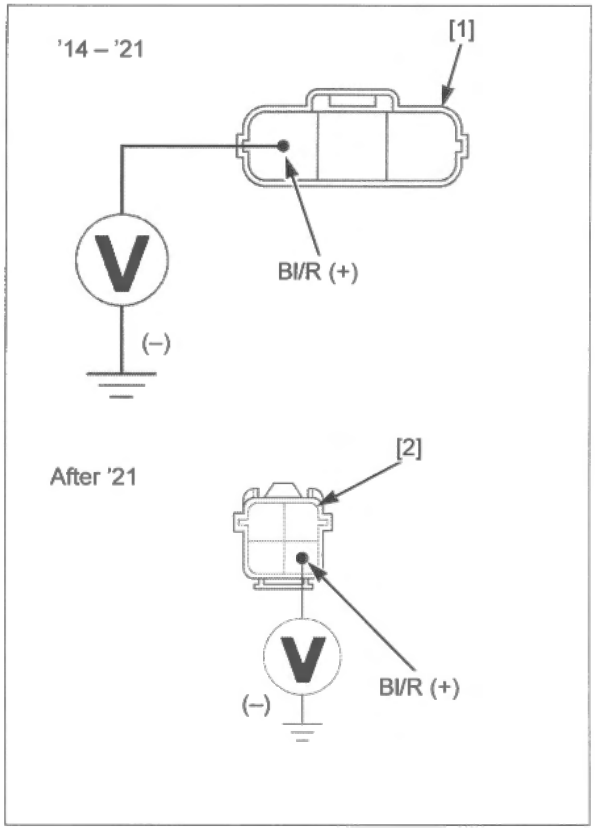
After' '21 models: Measure the voltage between the wire harness side 4P (Black) connector [2] terminal and ground.

Connection: Black/red (+) – ground (–)

Is the voltage more than 10 V?

YES – GO TO STEP 4.

NO – GO TO STEP 3.



3. Rear VS Sensor Power Input Line Open Circuit Inspection

Turn the ignition switch OFF.
Disconnect the PCM 33P (Black) connector (page 4-45).

'14 – '21 models: Check for continuity between the wire harness side 33P (Black) connector [1] and 3P (Black) connector [2] terminals

After' '21 models: Check for continuity between the wire harness side 33P (Black) connector [3] and 4P (Black) connector [4] terminals

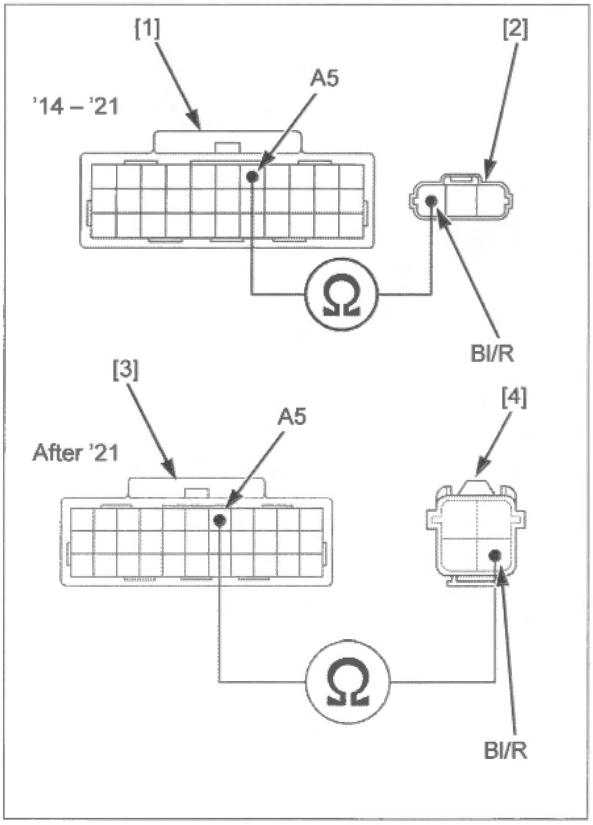
TOOL:
Pin Probe Male (2 pack) **07ZAJ-RDJA110**

Connection: A5 – Black/red

Is there continuity?

YES – Replace the PCM with a known good one (page 4-45) and recheck.

NO – Open circuit in the Black/red wire



4. Rear VS Sensor Ground Line Inspection

'14 – '21 models: Measure the voltage between the wire harness side 3P (Black) connector [1] terminals.

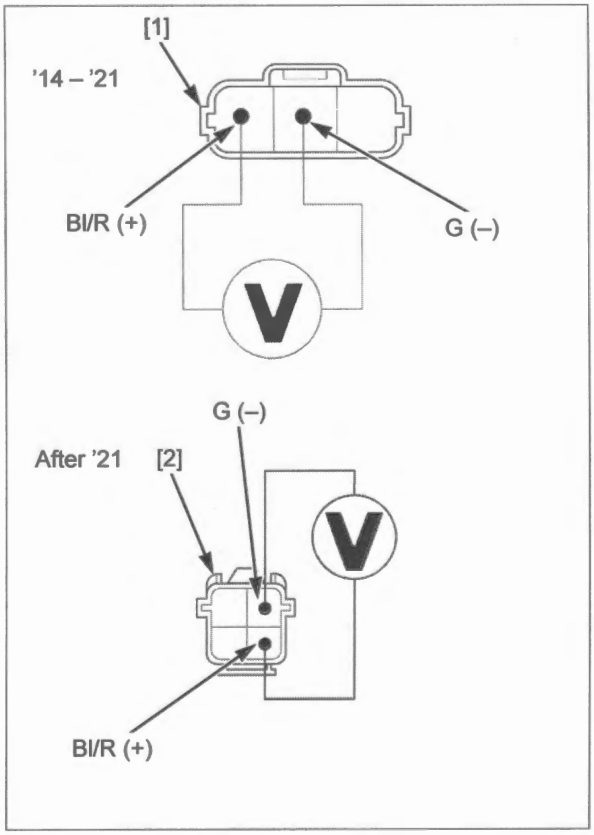
After' '21 models: Measure the voltage between the wire harness side 4P (Black) connector [2] terminals.

Connection: Black/red (+) – Green (–)

Is there battery voltage?

YES – GO TO STEP 5.

NO – Open circuit in the Green wire



5. Rear VS Sensor Output Line Inspection

'14 – '21 models: Measure the voltage between the wire harness side 3P (Black) connector [1] terminals.

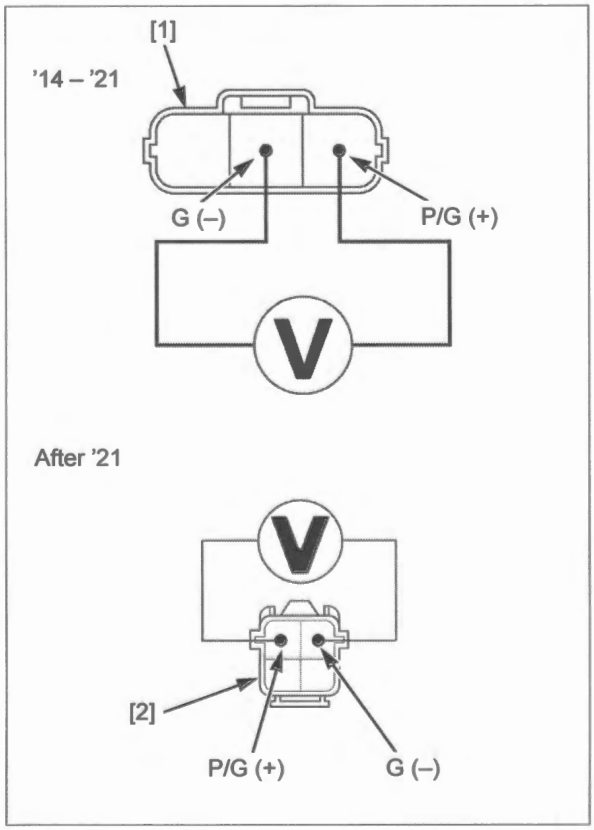
After' '21 models: Measure the voltage between the wire harness side 4P (Black) connector [2] terminals.

Connection: Pink/green (+) – Green (–)

Is the voltage about 5 V?

YES – GO TO STEP 6.

NO – Open or short circuit in the Pink/green wire.



6. Rear VS Sensor Inspection

Turn the ignition switch OFF.
Replace the rear VS sensor with a new one (page 13-65).
Erase the DTC (page 13-16).
Test-drive the vehicle and stop the engine.
Check the current DTC with the MCS.

Is DTC 66-1 indicated?

YES – Replace the PCM with a known good one (page 4-45) and recheck.

NO – Faulty original rear VS sensor

DTC 67-1 (FRONT VS SENSOR NO SIGNAL)

- Before starting the troubleshooting, check the front VS sensor 3P connector for loose or poor contacts, and recheck the DTC.

1. Front VS Sensor System Check

Erase the DTC (page 13-16).
Test-drive the vehicle and stop the engine.
Check the front VS sensor signal with the MCS.

Is the VS sensor signal indicated normally?

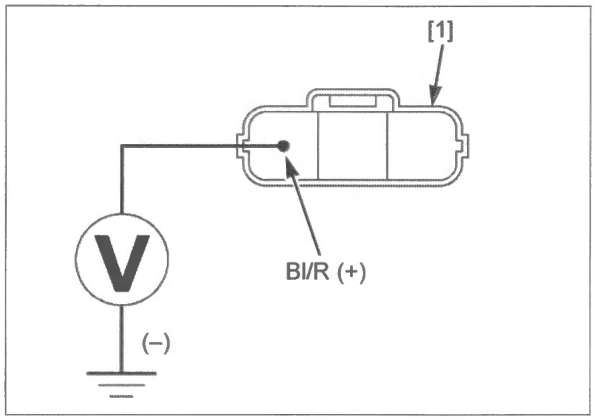
YES – Intermittent failure.

NO – GO TO STEP 2.

2. Front VS Sensor Power Input Voltage Inspection

Turn the ignition switch OFF.
Disconnect the front VS sensor 3P connector (page 13-66).
Turn the ignition switch ON.
Measure the voltage between the wire harness side 3P connector [1] terminal and ground.

Connection: Black/red (+) – ground (–)



Is the voltage more than 10 V?

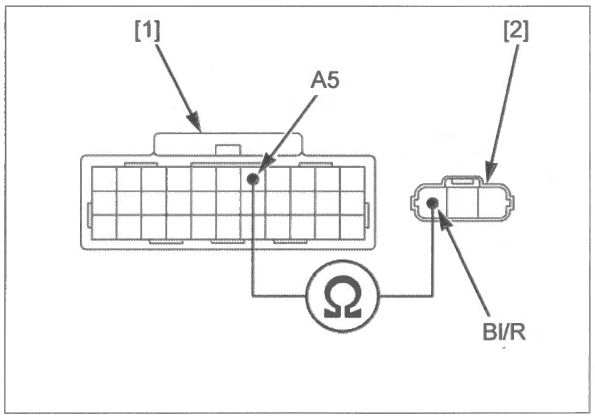
YES – GO TO STEP 4.

NO – GO TO STEP 3.

3. Front VS Sensor Power Input Line Open Circuit Inspection

Turn the ignition switch OFF.
Disconnect the PCM 33P (Black) connector (page 4-45).
Check for continuity between the wire harness side 33P (Black) connector [1] and 3P connector [2] terminals

TOOL:
Pin Probe Male (2 pack) **07ZAJ-RDJA110**



Connection: A5 – Black/red

Is there continuity?

YES – Replace the PCM with a known good one (page 4-45) and recheck.

NO – Open circuit in the Black/red wire

4. Front VS Sensor Ground Line Inspection

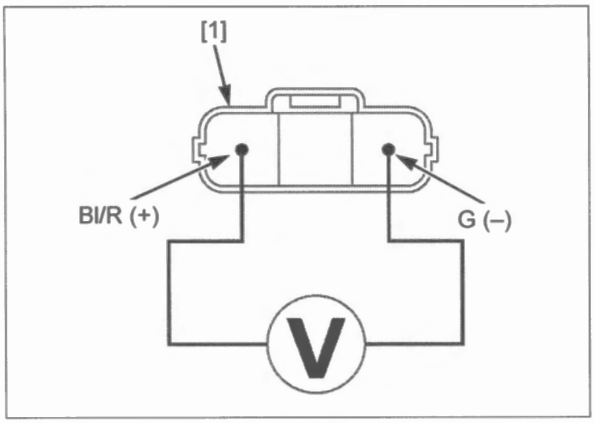
Measure the voltage between the wire harness side 3P connector [1] terminals.

Connection: Black/red (+) – Green (–)

Is there battery voltage?

YES – GO TO STEP 5.

NO – Open circuit in the Green wire



5. Front VS Sensor Output Line Inspection

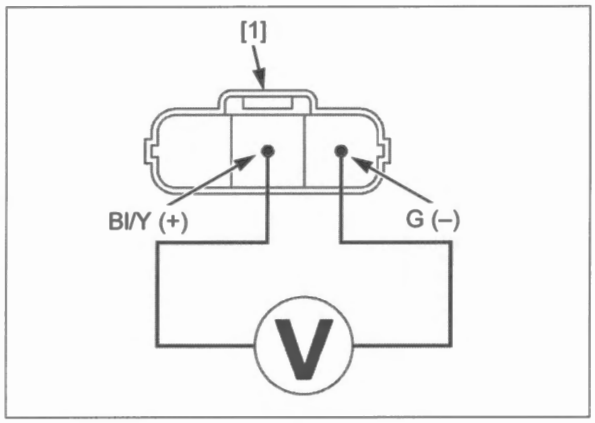
Measure the voltage between the wire harness side 3P connector [1] terminals.

Connection: Black/yellow (+) – Green (–)

Is the voltage about 5 V?

YES – GO TO STEP 6.

NO – Open or short circuit in the Black/yellow wire



6. Front VS Sensor Inspection

Turn the ignition switch OFF.
Replace the front VS sensor with a new one (page 13-66).
Erase the DTC (page 13-16).
Test-drive the vehicle and stop the engine.
Check the current DTC with the MCS.

Is DTC 67-1 indicated?

YES – Replace the PCM with a known good one (page 4-45) and recheck.

NO – Faulty original front VS sensor

FRONT CRANKCASE COVER/SPACER

REMOVAL

Remove the following:

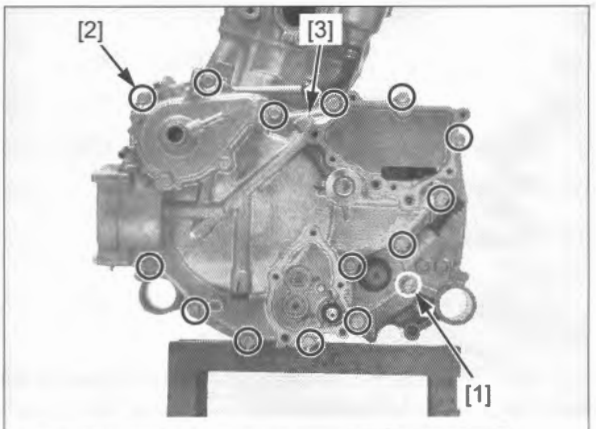
- engine guard (page 2-8)
- center mudguards (page 2-5)
- front propeller shaft - without removing the left drive shaft (page 21-32)
- shift valve body (page 13-69)
- shift control motor/reduction gears (page 13-59)

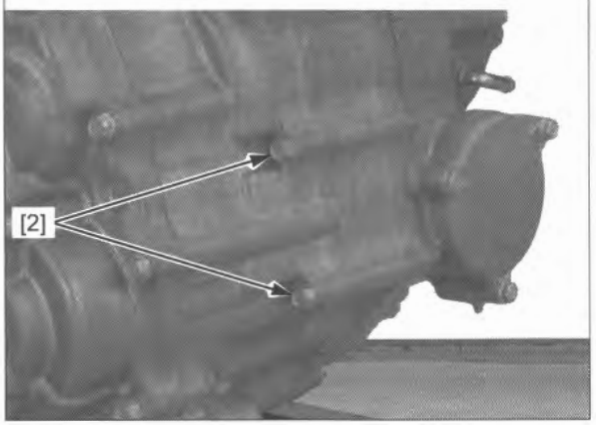
Loosen the bolt [1] of the front crankcase cover spacer.

Do not allow dust or dirt to enter the oil passages.

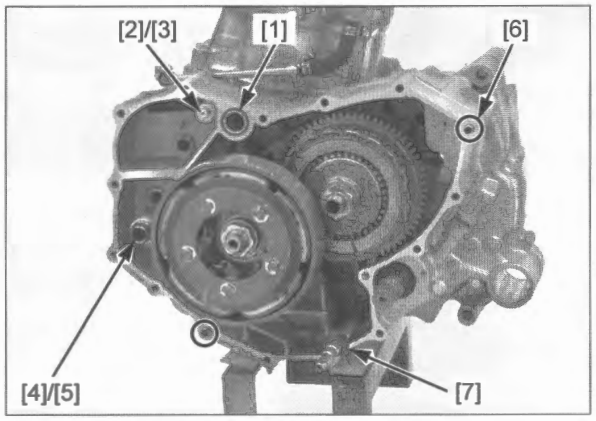
Remove the following:

- sixteen bolts [2]
- front crankcase cover [3]

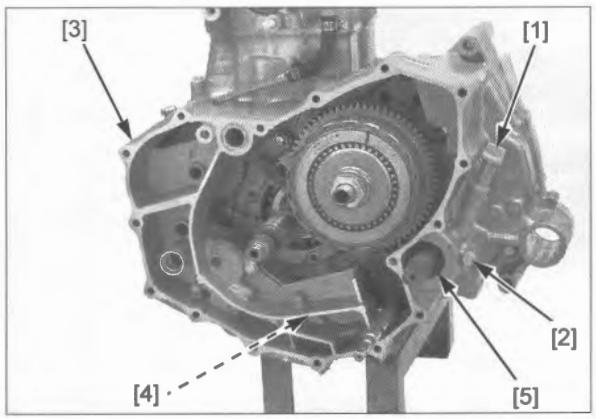




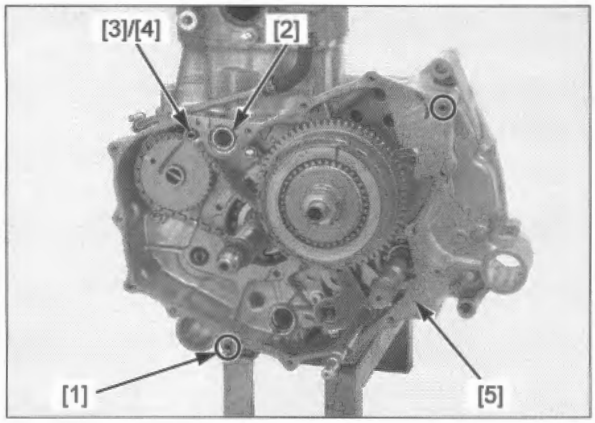
- O-ring [1]
- oil orifice [2] and O-rings [3]
- joint collar [4] and O-rings [5]
- two dowel pins [6]
- washer [7]



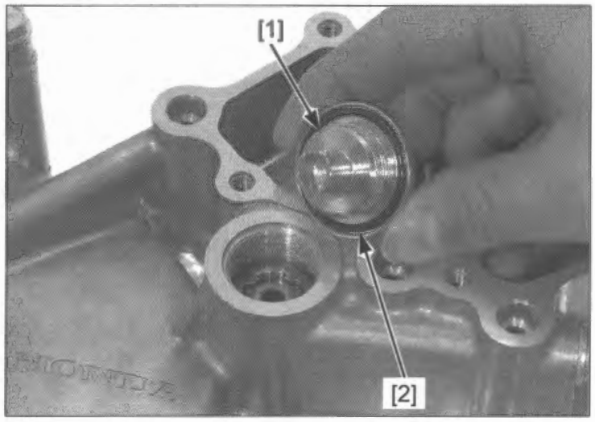
- centrifugal clutch (page 13-51)
- dipstick [1]
- bolt [2]
- front crankcase cover spacer [3]
- O-ring [4]
- output shaft oil seal [5]



– two dowel pins [1]
– O-ring [2]
– joint collar [3] and O-ring [4]
– gasket [5]

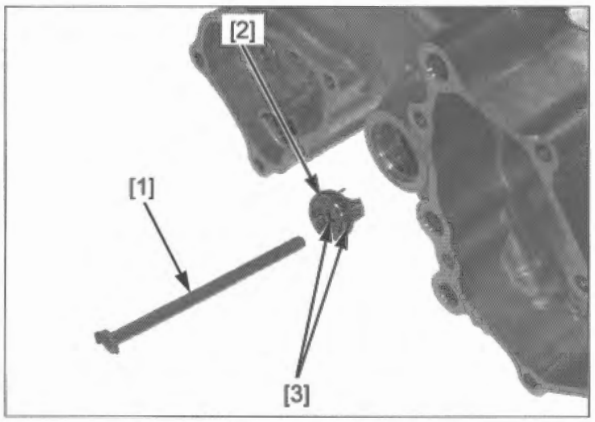


– setting cap [1] and O-ring [2]



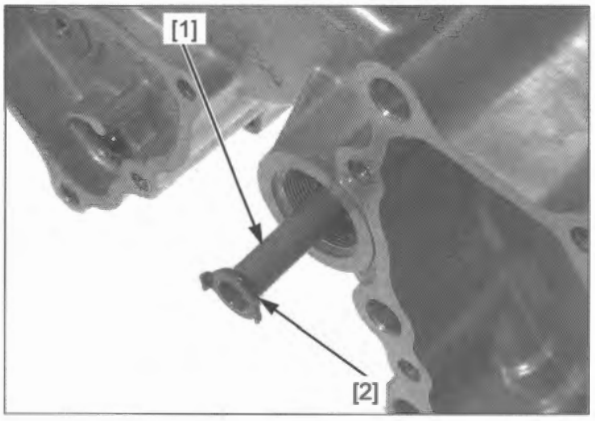
Do not allow dust or dirt to enter the oil pipe.

– feed pipe A [1]
– setting collar [2] and O-rings [3]

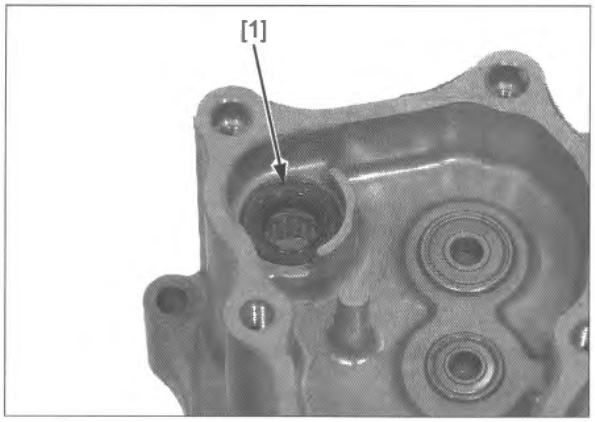


Do not allow dust or dirt to enter the oil pipe.

– feed pipe B [1] and O-ring [2]



– gearshift spindle oil seal [1]

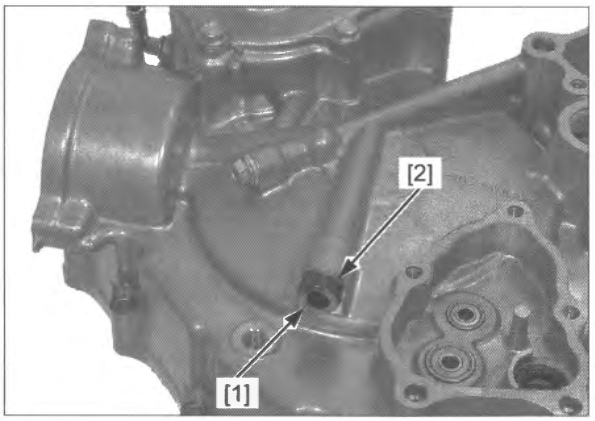


FRONT CRANKCASE COVER CLEANING/INSPECTION

Remove the oil filter (page 3-14).

Remove the socket bolt [1], sealing washer [2], spring and orifice relief valve.

Wash the crankcase cover with solvent and blow through the oil passages and orifices with compressed air to clean them thoroughly.

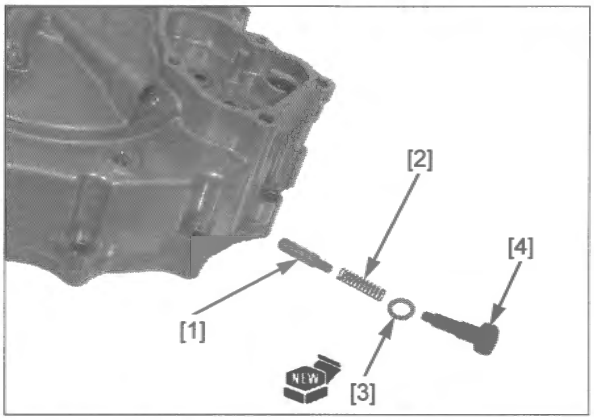


Check the orifice relief valve [1] for wear or damage.
Check the spring [2] for fatigue or damage.

Clean the orifice relief valve thoroughly.
Install the orifice relief valve, spring, new sealing washer [3] and socket bolt [4] and tighten it.

TORQUE: 34 N·m (3.5 kgf·m, 25 lbf·ft)

Install the oil filter (page 3-14).



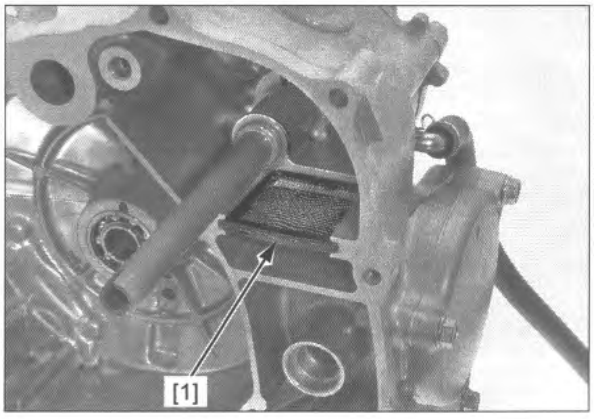
Remove the oil strainer [1].

Wash the strainer thoroughly in non-flammable or high flash point solvent until all accumulated dirt has been removed.
Blow dry it with compressed air to clean completely.
Before installing the strainer, the screen mesh should be examined closely for damage.
Install the oil strainer with the wedge facing the front side.

The feed pipes are used to supply the engine oil to the dual clutch.

Check the feed pipe A and B for abnormal wear or damage.

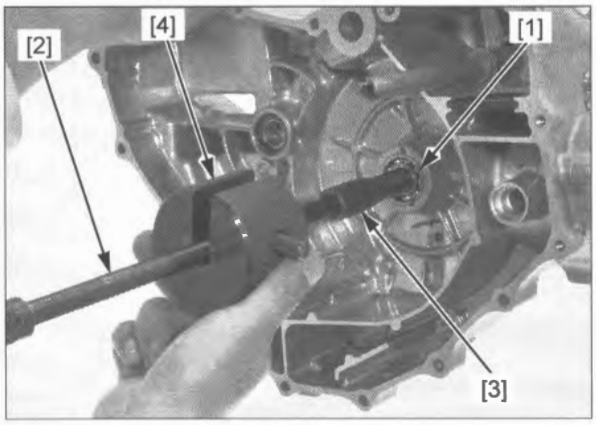
Check the crankshaft and mainshaft bearings for wear or damage.



BEARING REPLACEMENT

CRANKSHAFT BEARING

Remove the bearing [1] with the special tools.



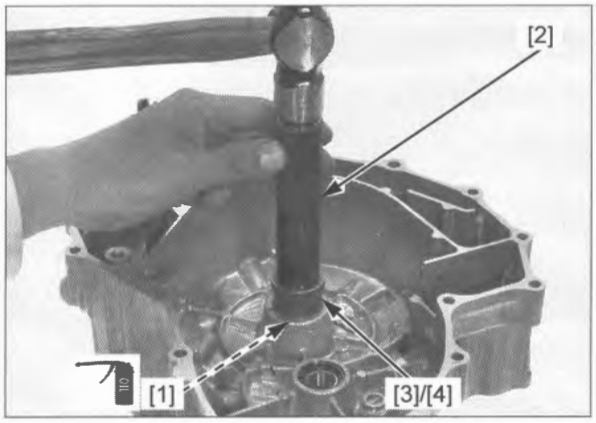
TOOLS:

[2] Bearing remover shaft	**07936-KC10100**
[3] Bearing remover head, 15 mm	**07936-KC10200**
[4] Remover weight	**07741-0010201**

U.S.A. TOOLS:

Bearing remover, 15 mm	**07936-KC10500**
Remover weight	**07936-371020A**

Apply engine oil to a new bearing [1].
Drive a new bearing squarely with the sealed side facing down until it is fully seated.

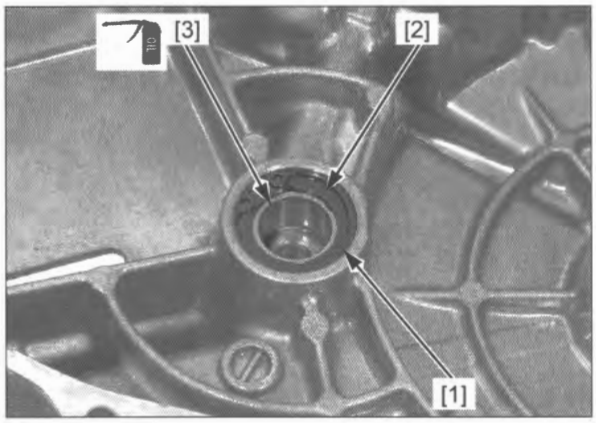


TOOLS:

[2] Driver	**07749-0010000**
[3] Attachment, 32 x 35 mm	**07746-0010100**
[4] Pilot, 15 mm	**07746-0040300**

MAINSHAFT BEARING

Remove the snap ring [1] and washer [2], and the bearing [3].



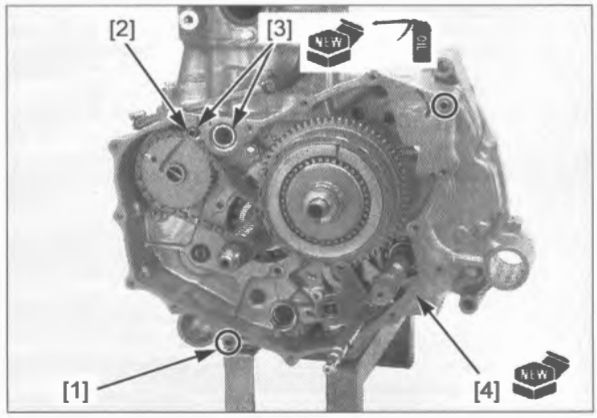
Apply engine oil to a new bearing.
Install the bearing until it is seated.

Install the washer and snap ring into the cover groove properly.

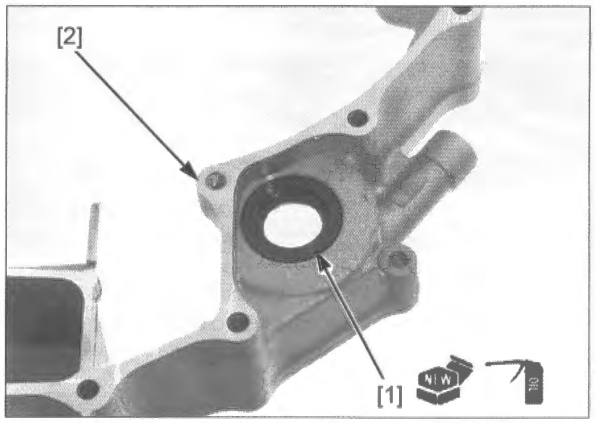
INSTALLATION

Install the two dowel pins [1] and oil joint pin [2].
Coat new O-rings [3] with the engine oil, and install them into the front crankcase groove and onto the oil joint pin.

Install a new gasket [4].

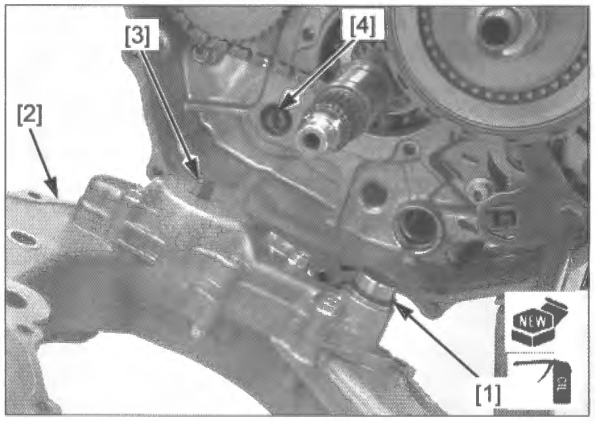


Apply engine oil to the lips of a new output shaft oil seal [1] and install it into the front crankcase cover spacer [2] until it is fully seated.



Coat a new O-ring [1] with engine oil and install it onto the joint pipe.

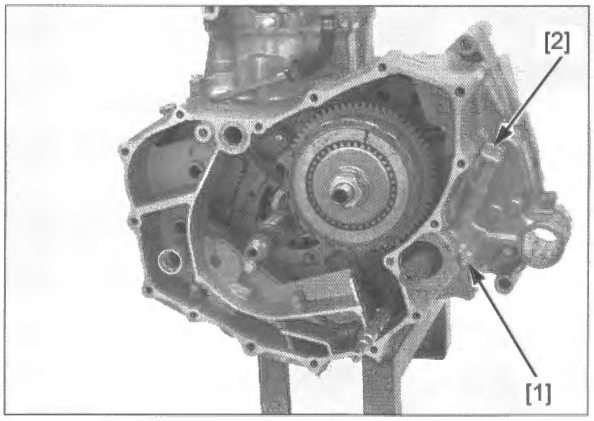
Install the front crankcase cover spacer [2] by aligning the oil pump shaft [3] end with the balancer shaft [4] groove.



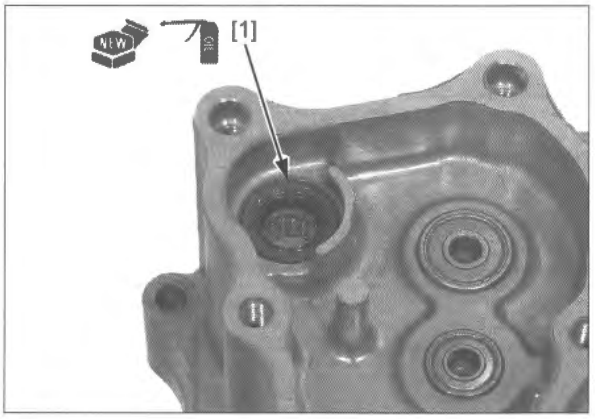
Loosely install the bolt [1].

Install the dipstick [2].

Install the centrifugal clutch (page 13-56).



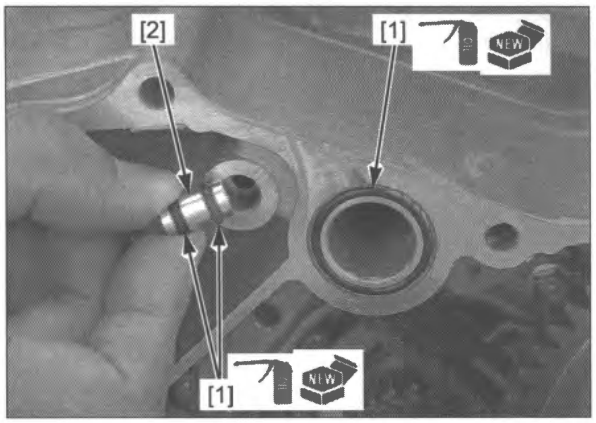
Apply engine oil to the lips of a new gearshift spindle oil seal [1] and install it into the front crankcase cover.



Coat new O-rings [1] with the engine oil.

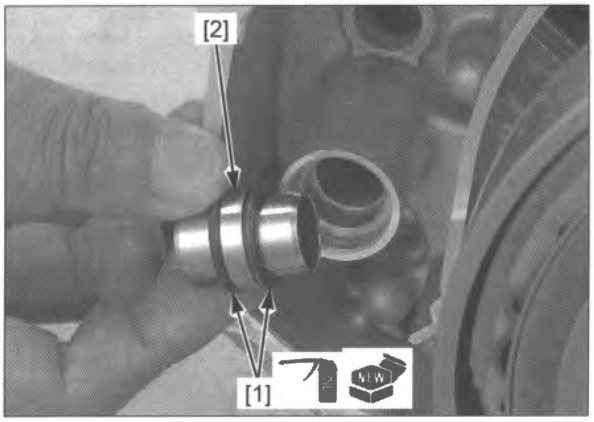
Install the O-ring into the groove of the spacer.

Install the O-rings onto the oil orifice [2] and install them into the hole of the spacer.

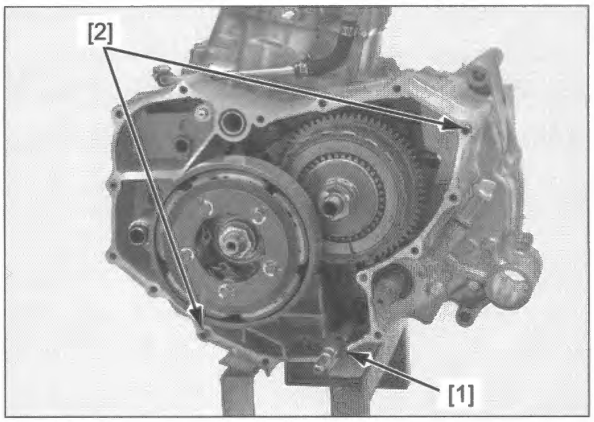


Coat new O-rings [1] with the engine oil and install the O-rings onto the joint collar [2].

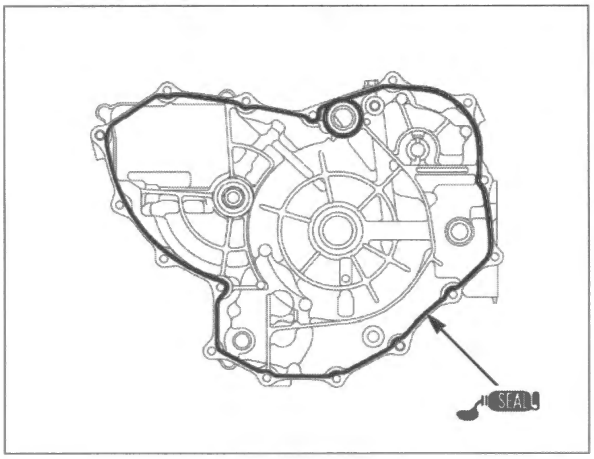
Install the joint collar into the hole of the spacer.



Install the washer [1] and two dowel pins [2].

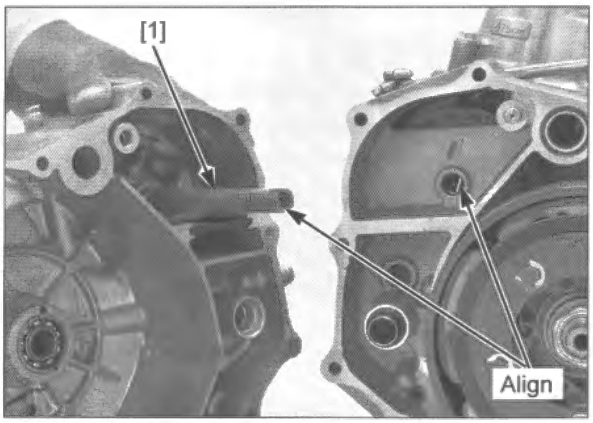


Apply liquid sealant (TB1215 or equivalent) to the mating surface (shadowed area) of the front crankcase cover as shown.

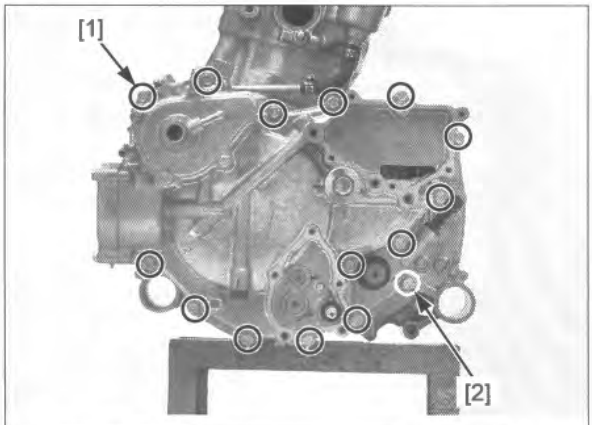


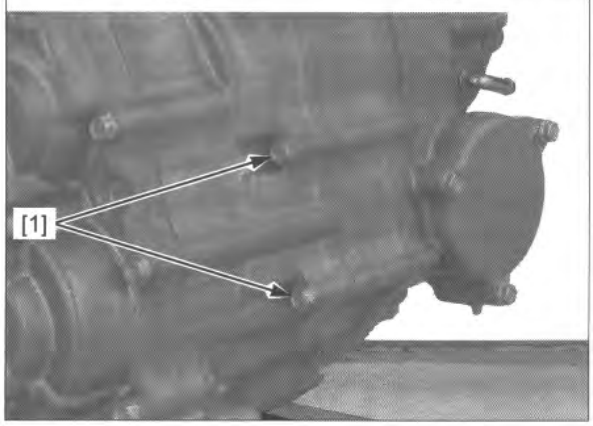
Be careful not to damage the oil seal lips.

Install the front crankcase cover, aligning the water pump shaft [1] end with the pin of the camshaft.



Install the sixteen bolts [1].
Tighten the sixteen bolts and spacer bolt [2] in a crisscross pattern in several steps.

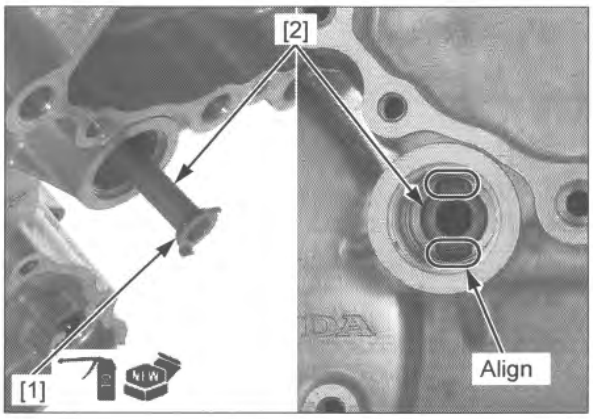




Coat a new O-ring [1] with engine oil and install it onto the flange of the feed pipe B [2].

Align the flange tabs with the grooves in the cover.

Carefully insert the pipe B into the crankcase cover.

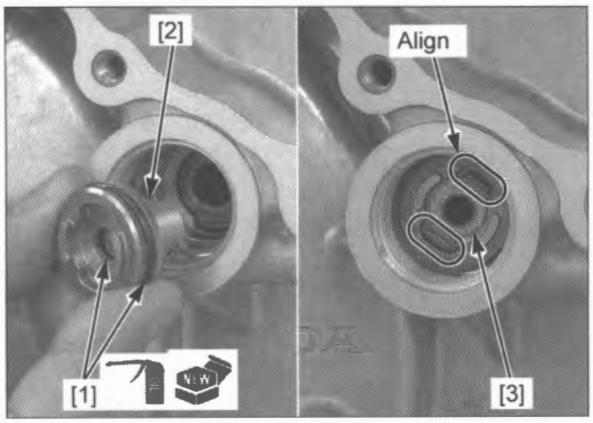


Coat new O-rings [1] with engine oil and install them into the setting collar [2] grooves.

Install the setting collar until it is seated.

Align the flange tabs with the grooves in the collar.

Carefully insert the pipe A [3] into the setting collar.



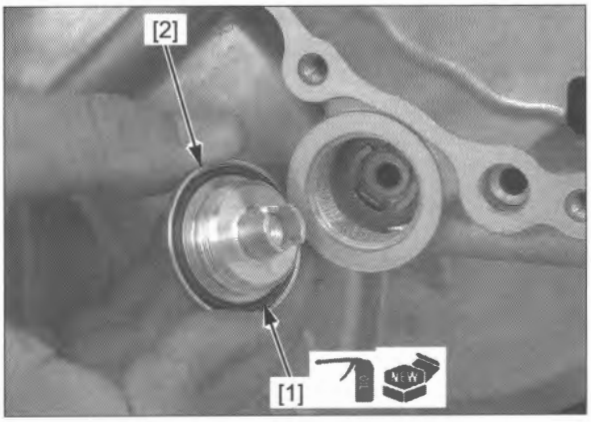
Coat a new O-ring [1] with engine oil and install it into the setting cap [2] groove.

Install the setting cap and tighten it.

TORQUE: 21 N·m (2.1 kgf·m, 15 lbf·ft)

Install the following:

- shift control motor/reduction gears (page 13-60)
- shift valve body (page 13-69)
- front propeller shaft (page 21-57)
- center mudguards (page 2-5)
- engine guard (page 2-8)



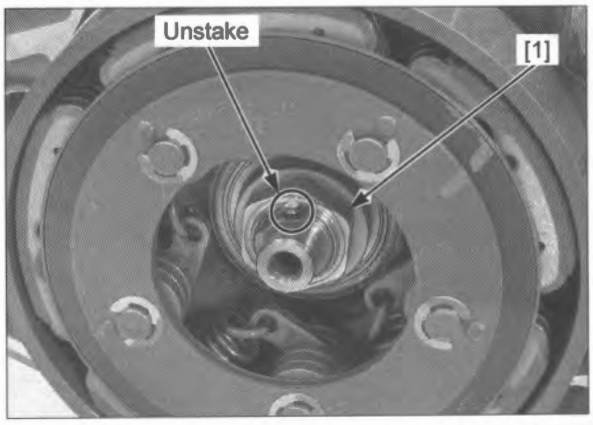
CENTRIFUGAL CLUTCH

REMOVAL

Remove the front crankcase cover (page 13-44).

Be careful not to damage the crankshaft threads.

Unstake the clutch lock nut [1].

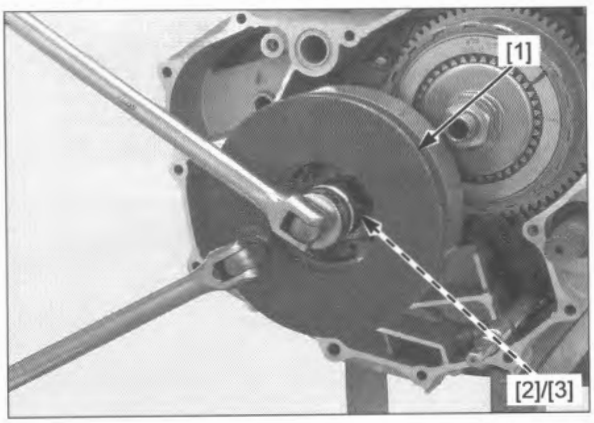


Hold the clutch drive plate using the special tool and loosen the lock nut.

TOOL:

[1] Clutch holder	**07GMB-HA70101 or 07GMB-HA7010B (U.S.A. only)**

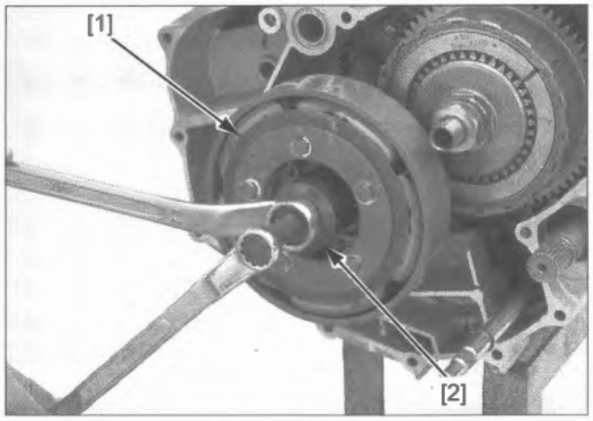
Remove the lock nut [2] and washer [3].



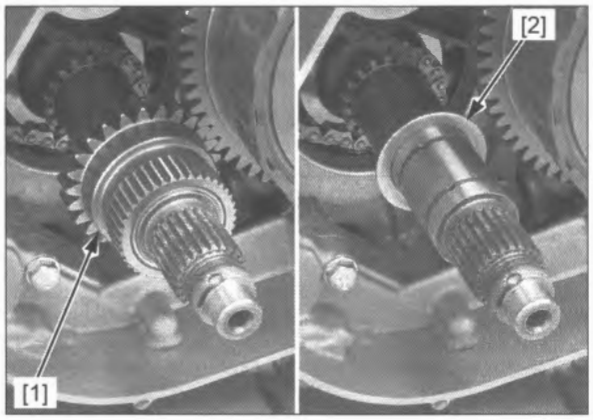
Remove the centrifugal clutch assembly [1] using the special tool.

TOOL:

[2] Clutch puller, 35 x 1.0 mm	**07933-HA80000 or 07933-HB3000A (U.S.A. only)**



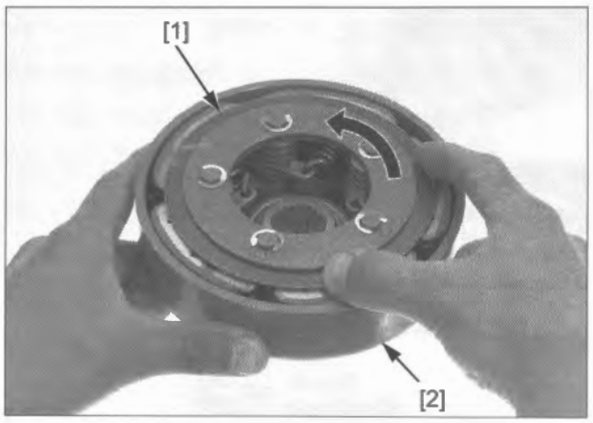
Remove the primary drive gear [1] and washer [2].



DISASSEMBLY

You should be able to turn the clutch weight assembly [1] counterclockwise smoothly, but the assembly should not turn clockwise.

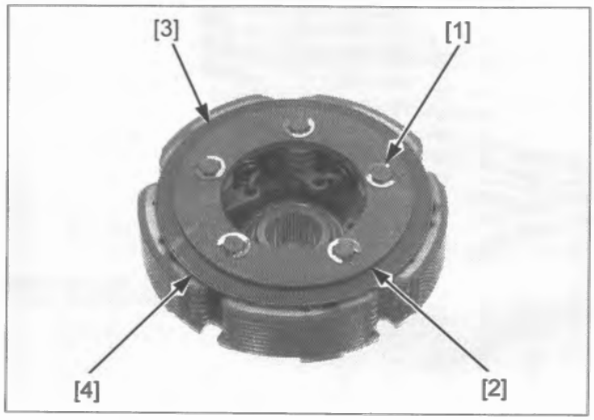
Remove the clutch weight assembly from the clutch drum [2] while turning it counterclockwise.



Remove the E-clips [1] using a screwdriver while compressing the clutch spring.

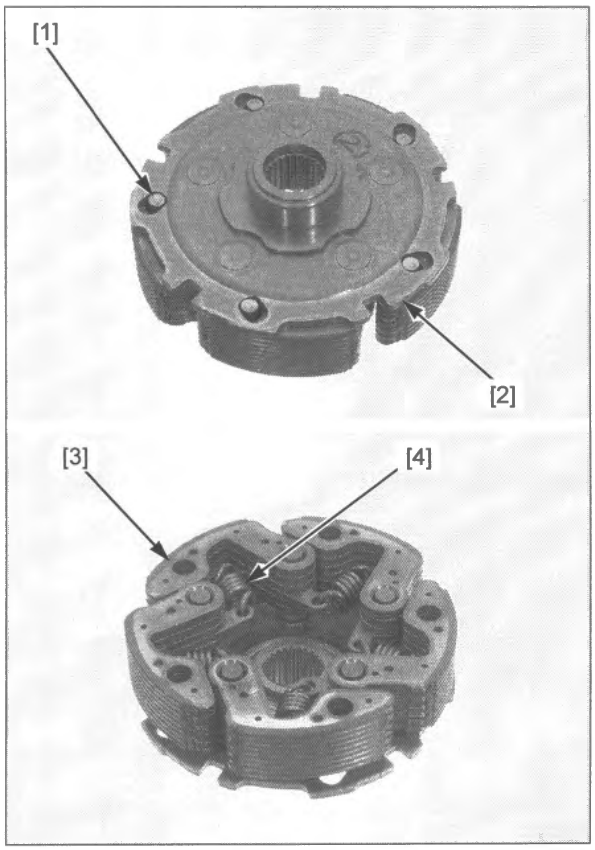
Remove the following:

- outer plate [2]
- clutch spring [3]
- inner plate [4]



Tap the bosses [1] evenly until they are released from the holes of the drive plate [2].

Remove the clutch weights [3] and springs [4] from the drive plate.



INSPECTION

Inspect the following parts for scratches, damage, abnormal wear and deformation. Replace if necessary.

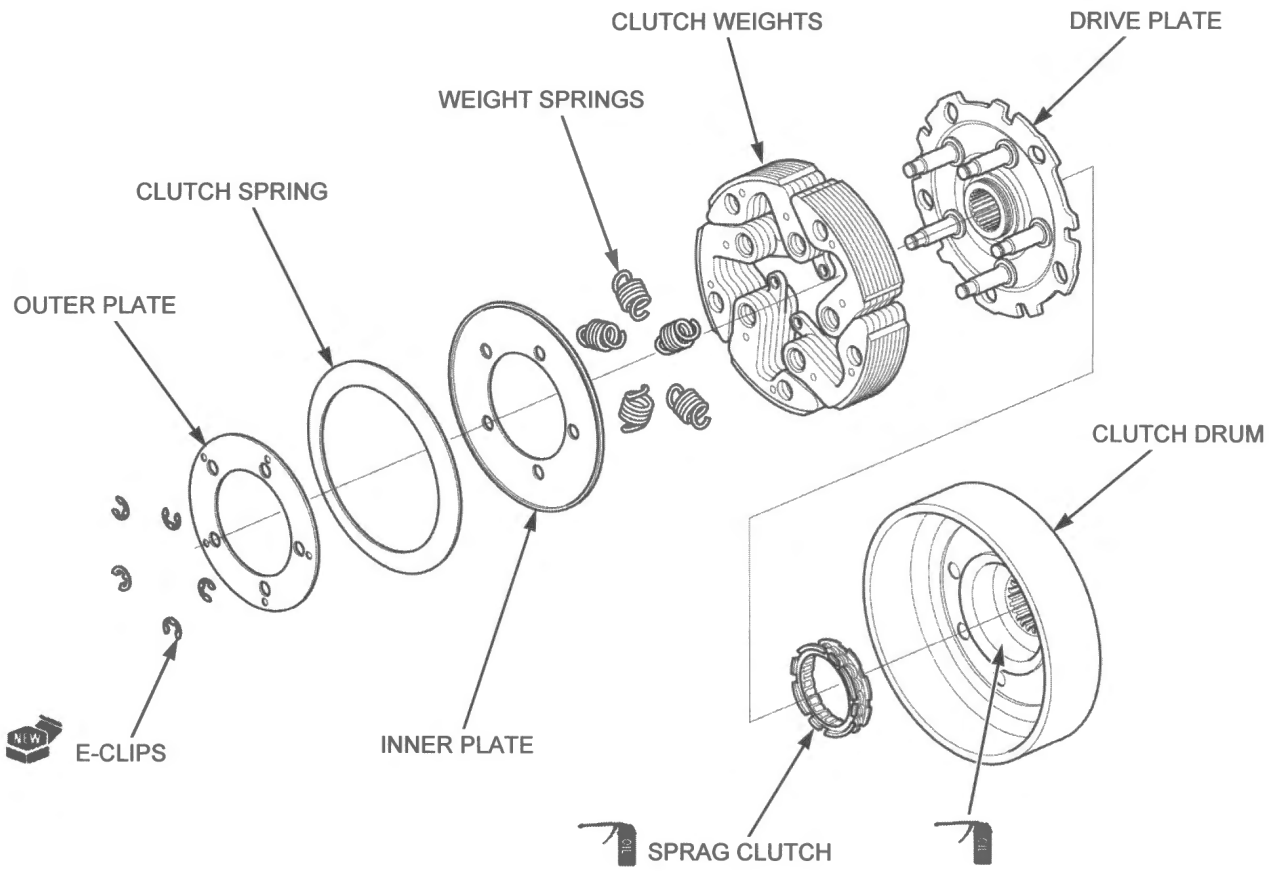
- clutch drum
- sprag clutch
- drive plate
- clutch weights
- clutch weight springs

Measure each part according to CLUTCH/GEARSHIFT LINKAGE SPECIFICATIONS (page 1-13).

Replace any part if it is out of service limit.

- Replace the clutch weight springs as a set.
- Replace the clutch weights as a set.

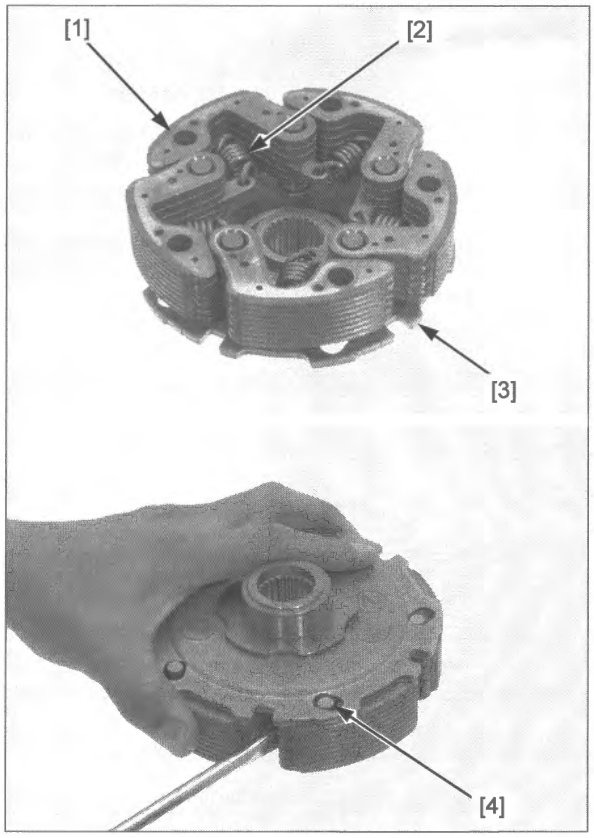
ASSEMBLY



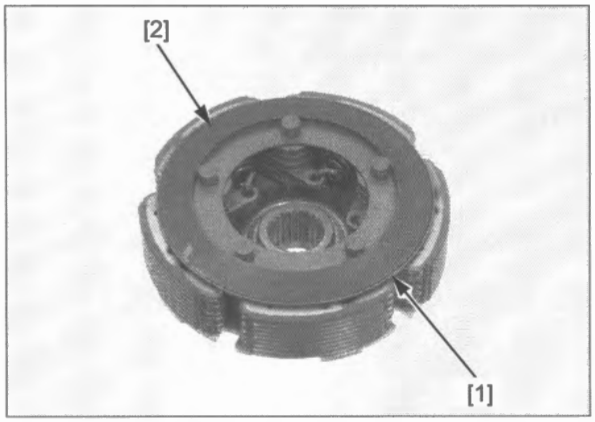
Install with the spring's open ends facing in.

Set the clutch weights [1] and springs [2] onto the drive plate [3] as shown.

Insert a screwdriver between the clutch weights and stretch the spring so that the bosses [4] are aligned with the holes of the drive plate.
Push the clutch weights until they are fully seated.



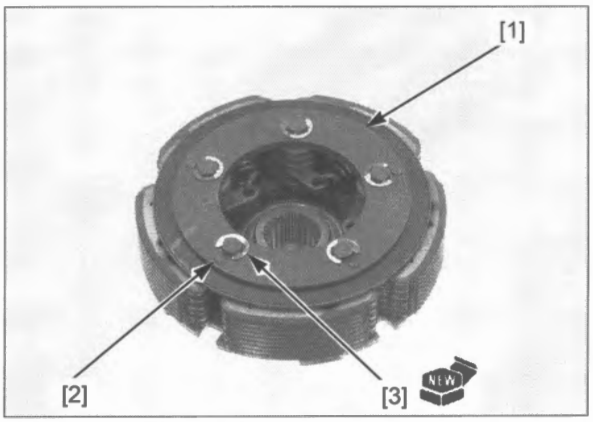
Install the inner plate [1] with flange side facing up.
Install the clutch spring [2] with concavity side facing down.



Install the outer plate [1] with the pins [2] facing up.

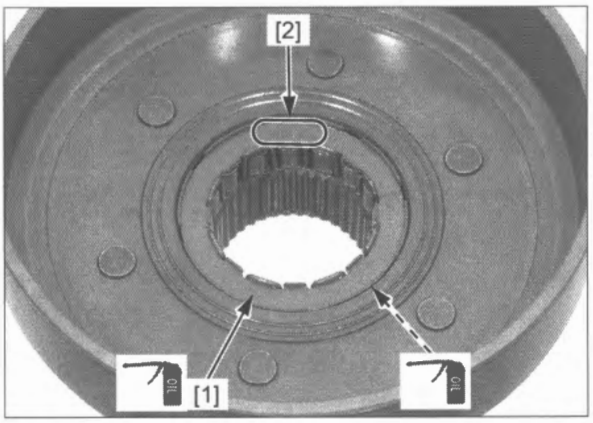
Be careful not to damage the clutch weights while compressing.

Install new E-clips [3] into the spindle grooves with its gap facing towards the pin using the pliers while compressing the clutch spring.



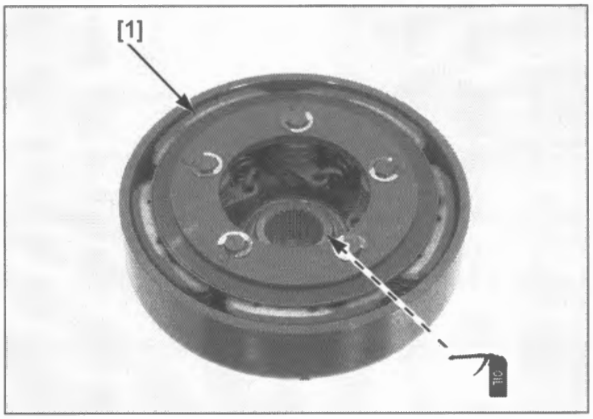
Apply engine oil to the sprag clutch [1] whole surface and the sprag clutch contacting surface of the clutch drum.

Install the sprag clutch into the clutch drum with the "OUT SIDE" mark [2] facing up.



Apply engine oil to the sprag clutch contacting surface of the drive plate boss.

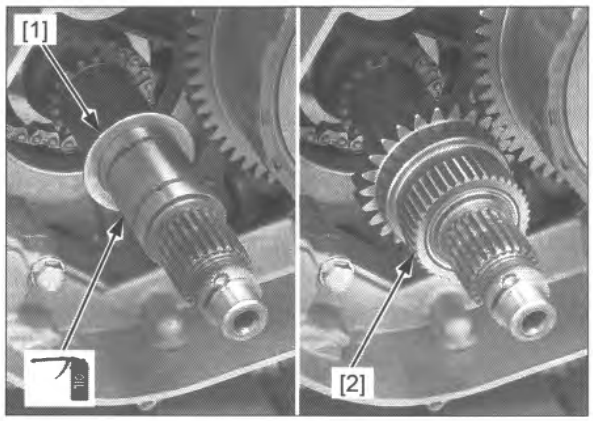
Install the clutch weight assembly [1] while turning it counterclockwise.



INSTALLATION

Apply engine oil to the primary drive gear sliding surface of the crankshaft.

Install the washer [1] and primary drive gear [2] onto the crankshaft.

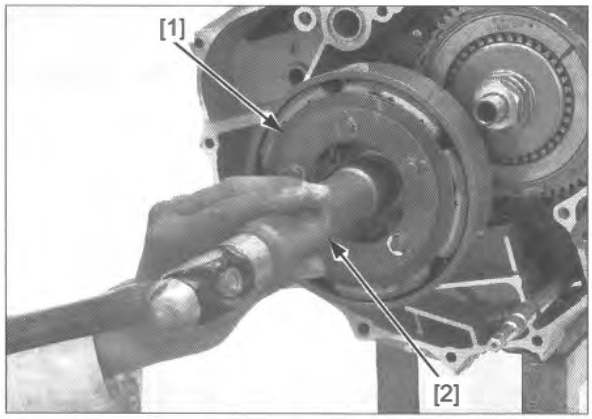


Set the centrifugal clutch assembly [1] onto the crankshaft by aligning the splines of the drive plate and crankshaft, and the splines of the clutch drum and primary drive gear.

Be careful not to damage the crankshaft threads.

Tap the drive plate to seat the clutch assembly.

TOOL:
[2] Driver, 22 mm I.D. 07746-0020100

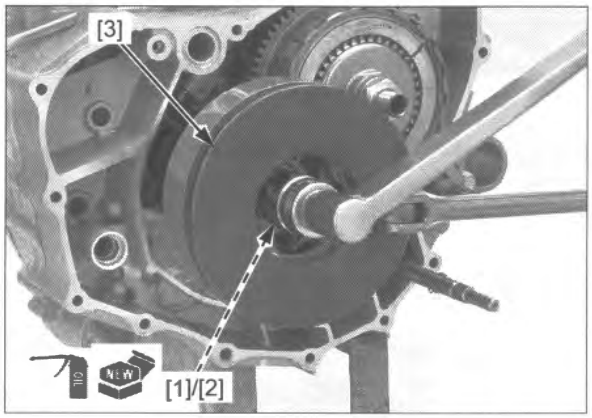


Apply engine oil to the threads and seating surface of a new lock nut [1].
Install the washer [2] and lock nut.

Hold the drive plate of the centrifugal clutch assembly with the special tool and tighten the lock nut.

TOOL:
[3] Clutch holder 07GMB-HA70101 or 07GMB-HA7010B (U.S.A. only)

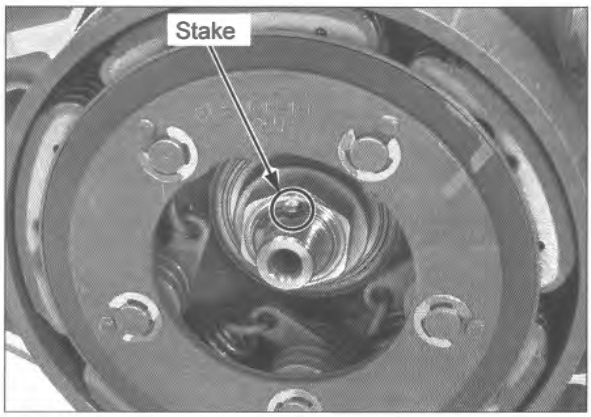
TORQUE: 118 N·m (12.0 kgf·m, 87 lbf·ft)



Be careful not to damage the crankshaft threads.

Stake the lock nut into the crankshaft groove.

Install the front crankcase cover (page 13-47).

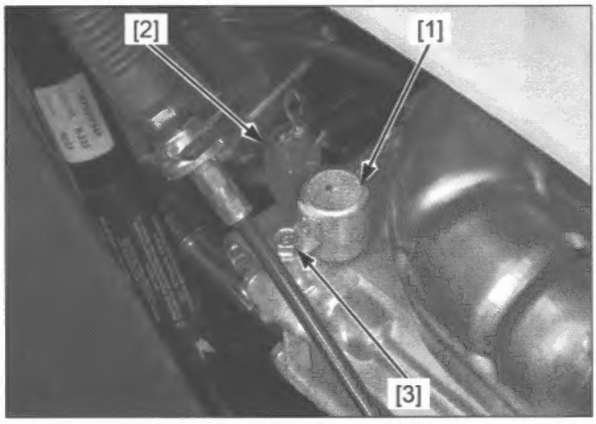


SHIFT SOLENOID VALVE

REPLACEMENT

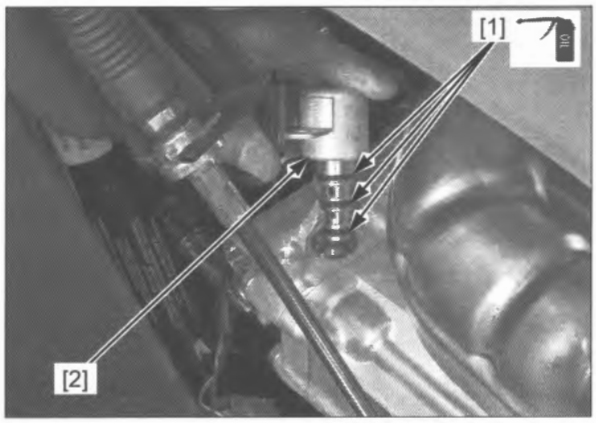
Remove the tank cover assembly (page 2-4).

Clean around the shift solenoid valve [1] with compressed air to remove dust, dirt and foreign material.
Disconnect the 2P connector [2] and remove the bolt [3].
Remove the shift solenoid valve from the valve body by pulling it.



Apply engine oil to the O-rings [1] of a new shift solenoid valve [2].
Install the solenoid valve into the valve body and tighten the bolt.
Connect the 2P connector.

Install the tank cover assembly (page 2-4).



SHIFT SPINDLE ANGLE SENSOR

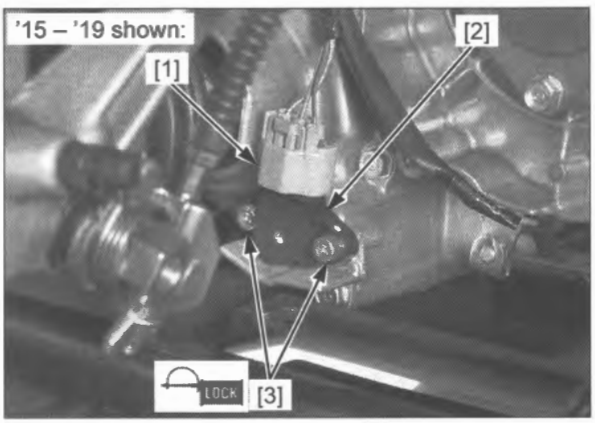
REMOVAL/INSTALLATION

Remove the following:

- engine guard (page 2-8)
- right center mudguard (page 2-5)

Disconnect the 3P (Gray) connector [1] from the shift spindle angle sensor [2].

Remove the two socket bolts [3] and shift spindle angle sensor from the rear crankcase cover.

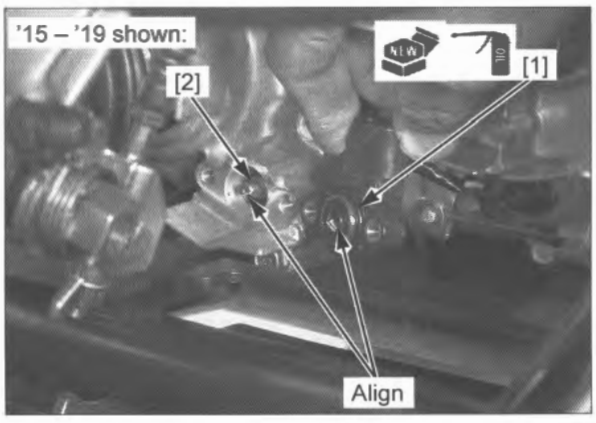


Coat a new O-ring [1] with engine oil and install it into the shift spindle angle sensor groove.
Install the shift spindle angle sensor by aligning the flat surface of the sensor hole and gearshift spindle [2] end.

Apply locking agent to the socket bolt threads.
Install the socket bolts and tighten them.

TORQUE: 6 N·m (0.6 kgf·m, 4.4 lbf·ft)

Install the removed part in the reverse order of removal.



TR SENSOR (After '19)

REMOVAL/INSTALLATION

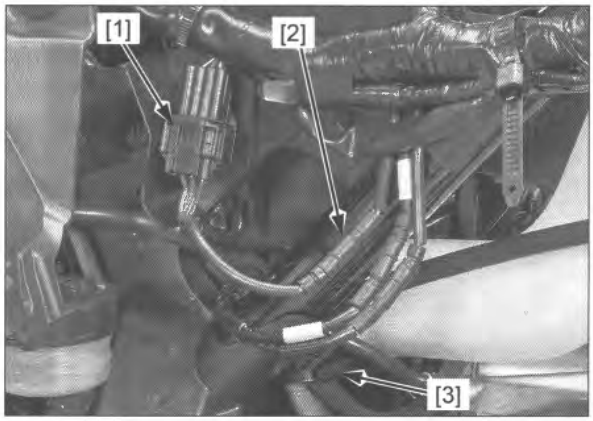
Remove the following:

- engine guard (page 2-8)
- right center mudguard (page 2-5)

Disconnect the following:

- sensor harness 8P (Black) connector [1]
- neutral switch wire connector [2]

Remove the harness band [3].

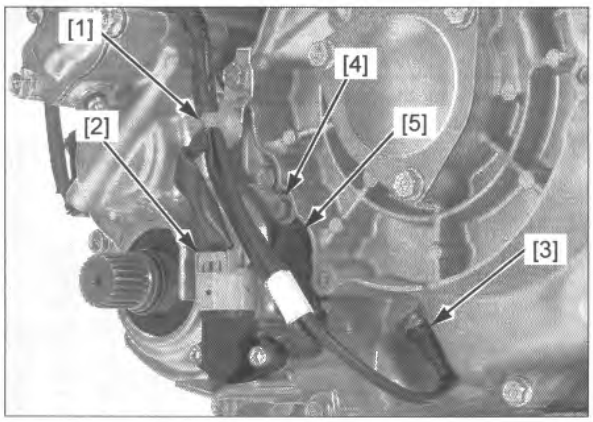


Release the harness clip [1].

Disconnect the following:

- spindle angle sensor 3P (Gray) connector [2]
- neutral switch wire connector [3]

Remove the bolt [4] and TR sensor [5] from the rear crankcase cover.



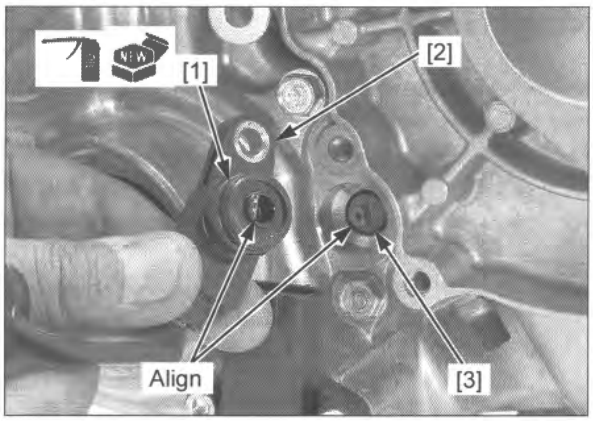
Coat a new O-ring [1] with engine oil and install it into the TR sensor [2] groove.

Install the TR sensor by aligning the flat surface of the sensor hole and shift drum [3] end.

Install the bolt and tighten it.

TORQUE:
TR sensor mounting bolt:
12 N·m (1.2 kgf·m, 9 lbf·ft)

Install the removed part in the reverse order of removal.



NEUTRAL SWITCH (After '19)

REMOVAL/INSTALLATION

Remove the following:

- engine guard (page 2-8)
- right center mudguard (page 2-5)

Disconnect the neutral switch connector [1].

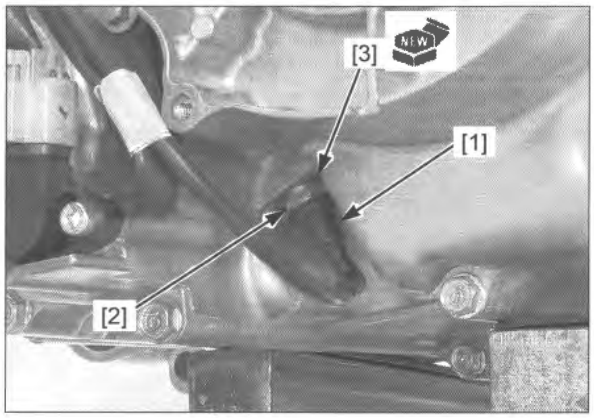
Remove the neutral switch [2] and sealing washer [3].

Install the removed part in the reverse order of removal.

NOTE:

- Replace the sealing washer with a new one.

TORQUE: 13 N·m (1.3 kgf·m, 10 lbf·ft)



SHIFT CONTROL MOTOR/REDUCTION GEARS

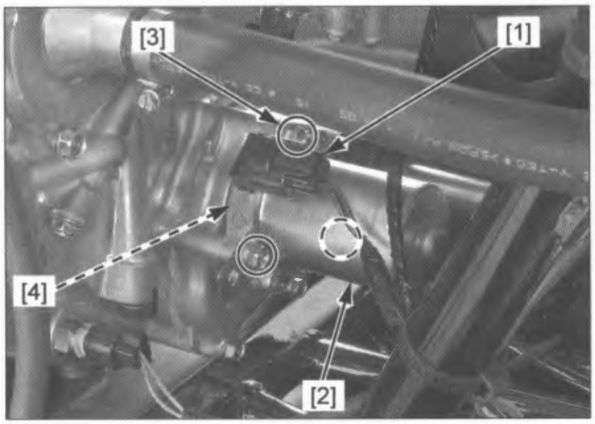
REMOVAL

Remove the right center mudguard (page 2-5).

Disconnect the 2P connector [1] from the shift control motor [2].

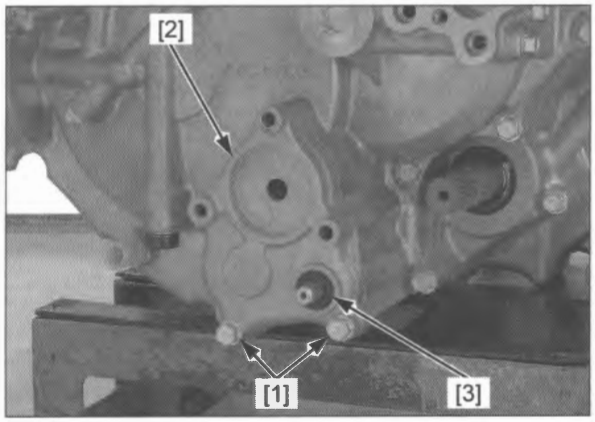
Remove the three bolts [3], wire clip stay and shift control motor.

Remove the O-ring [4] from the shift control motor.



Remove the two bolts [1] and reduction gear cover [2].

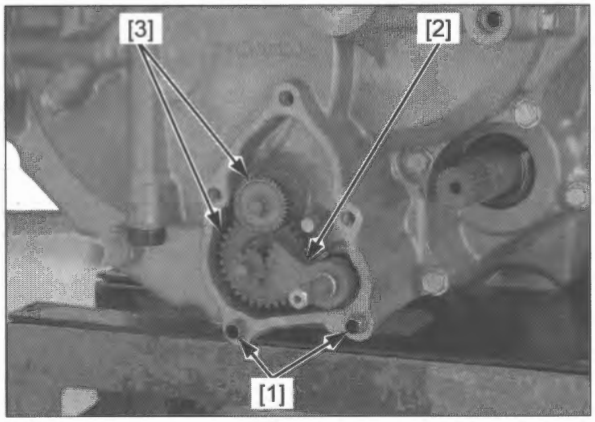
Remove the oil seal [3] from the gear cover.



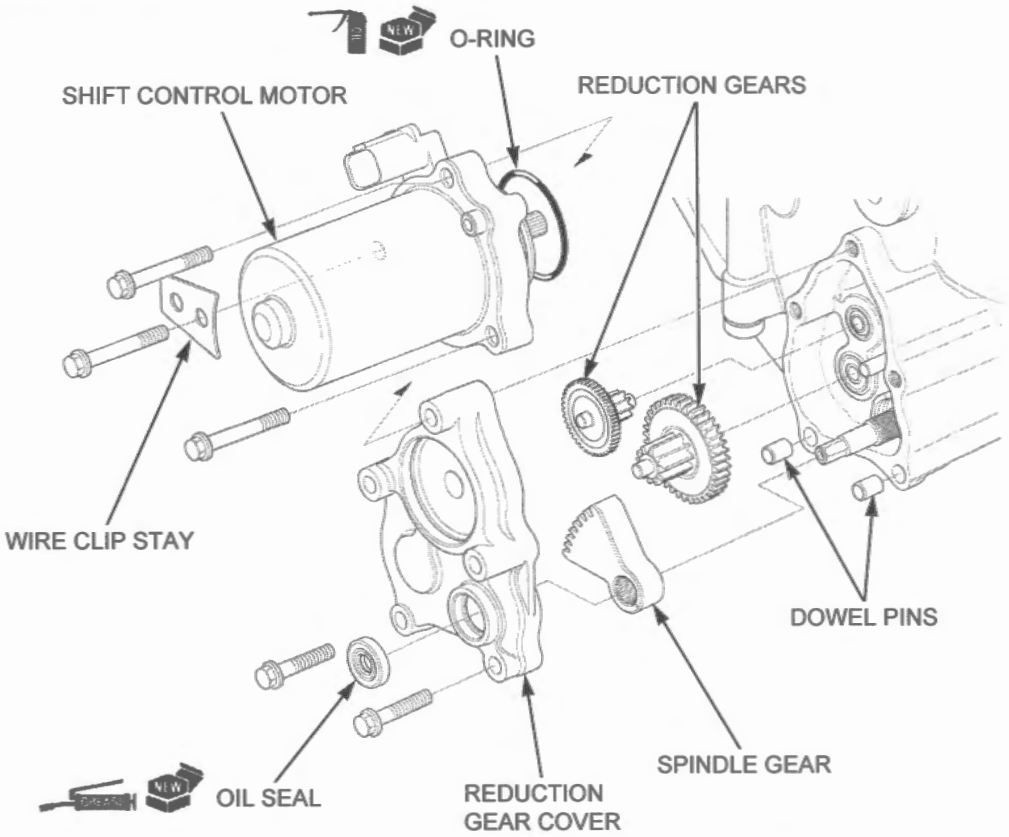
Remove the two dowel pins [1].

Remove the spindle gear [2] and reduction gears [3].

Remove any grease from the gears, gear cover and front crankcase cover.



INSTALLATION

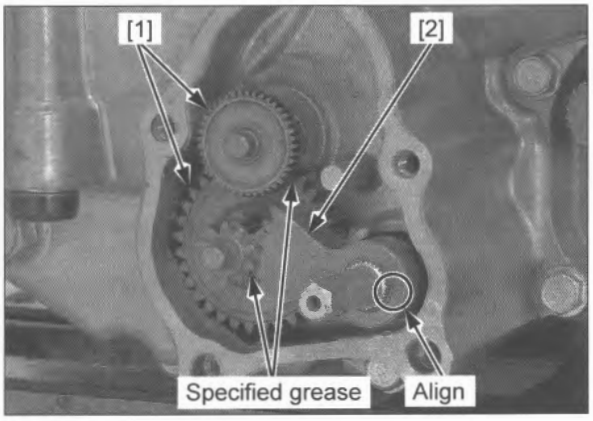


Clean the mating surfaces of the reduction gear cover and front crankcase cover thoroughly.

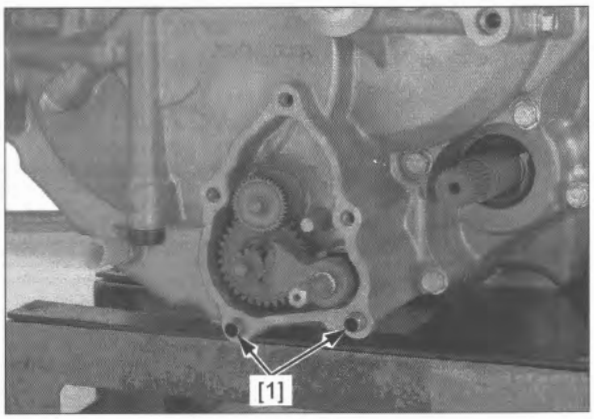
Apply 2 – 4 g (0.07 – 0.14 oz) of specified grease to the reduction gear [1] journals and gear teeth.

SPECIFIED GREASE: UNIREX N3 grease (EXXON)

Install the reduction gears into the front crankcase cover.
Install the spindle gear [2] onto the gearshift spindle by aligning the punch mark with the wide tooth.

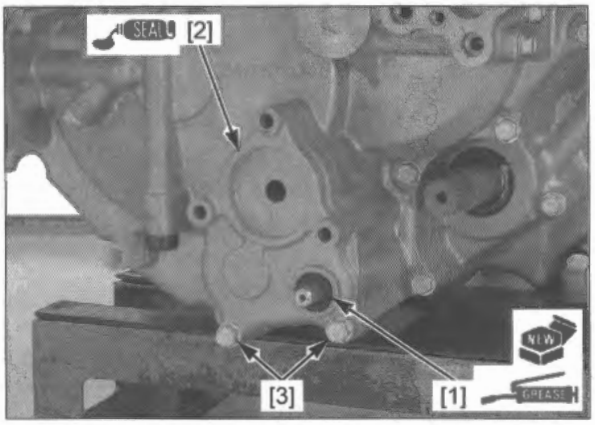


Install the two dowel pins [1].

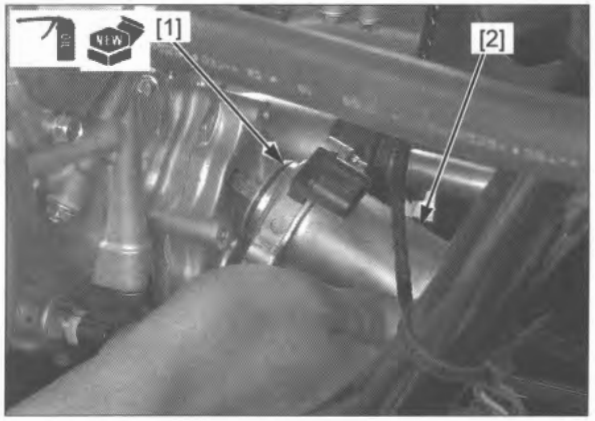


Apply grease to a new oil seal [1] lip and install it into the reduction gear cover [2].

Apply sealant to the mating surface of the reduction gear cover.
Install the cover with the two bolts [3].



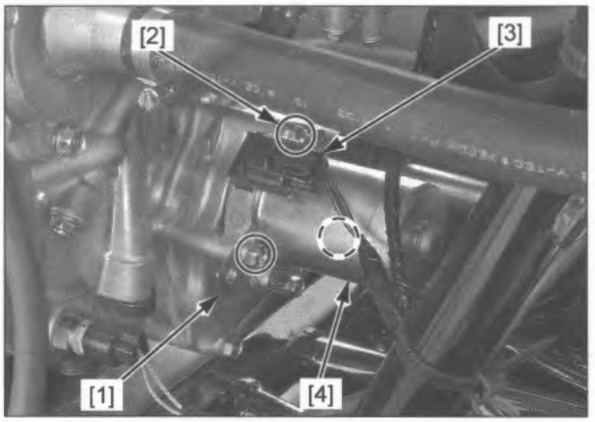
Coat a new O-ring [1] with engine oil and install it into the control motor groove.
Install the shift control motor [2] onto the front crankcase cover.



Install the wire clip stay [1] and three bolts [2].
Tighten the five bolts in a crisscross pattern in two or three steps.

Connect the 2P connector [3] to the shift control motor [4].

Install the right center mudguard (page 2-5).



SHIFT DRUM POSITION SWITCH ('15 – '19)

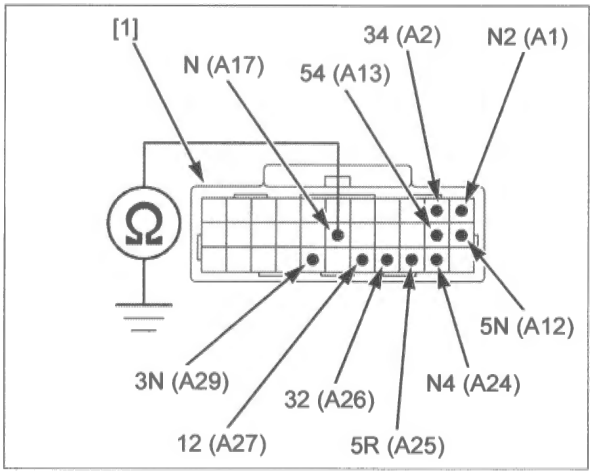
SYSTEM INSPECTION

Turn the ignition switch OFF and disconnect the PCM 33P (Black) connector (page 4-45).

Check for continuity between wire harness side 33P (Black) connector [1] terminals and ground.

There should be continuity only at the terminal that corresponds to the shift drum position (open circuit inspection).
There should be no continuity at the other terminals (short circuit inspection).
You must test at ten terminals in each shift drum position.

TOOL:
Pin Probe Male (2 pack) **07ZAJ-RDJA110**

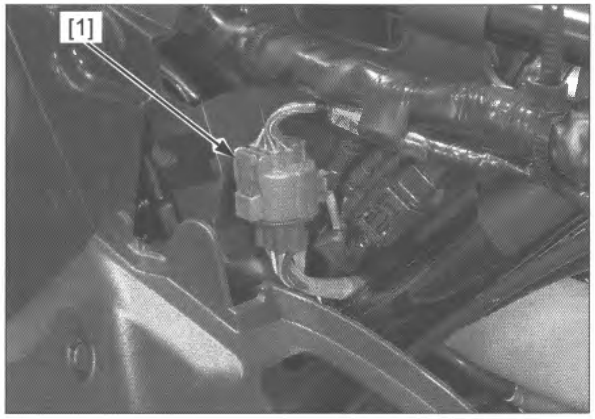


Shift drum position	Connector terminal
5R (5th/Reverse)	A25
N (Neutral)	A17
12 (1st/2nd)	A27
N2 (Neutral/2nd)	A1
32 (3rd/2nd)	A26
3N (3rd/Neutral)	A29
34 (3rd/4th)	A2
N4 (Neutral/4th)	A24
54 (5th/4th)	A13
5N (5th/Neutral)	A12

SWITCH INSPECTION

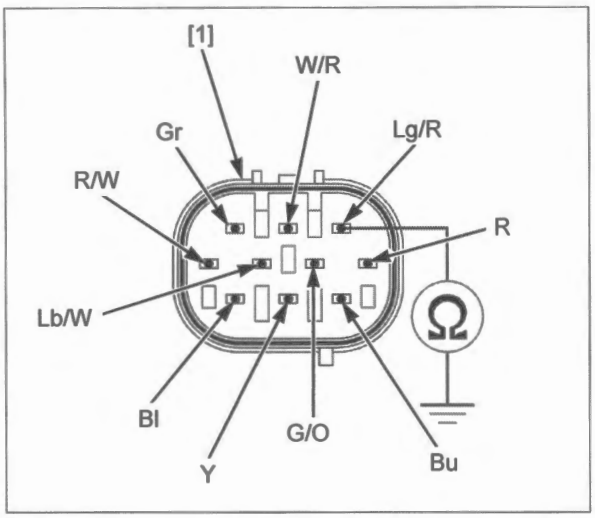
Remove the tank cover assembly (page 2-4).

Turn the ignition switch OFF and disconnect the shift drum position switch 10P (Gray) connector [1].



Check for continuity between switch side 10P (Gray) connector [1] terminals and ground.

There should be continuity only at the terminal that corresponds to the shift drum position (open circuit inspection).
There should be no continuity at the other terminals (short circuit inspection).
You must test at ten terminals in each shift drum position.

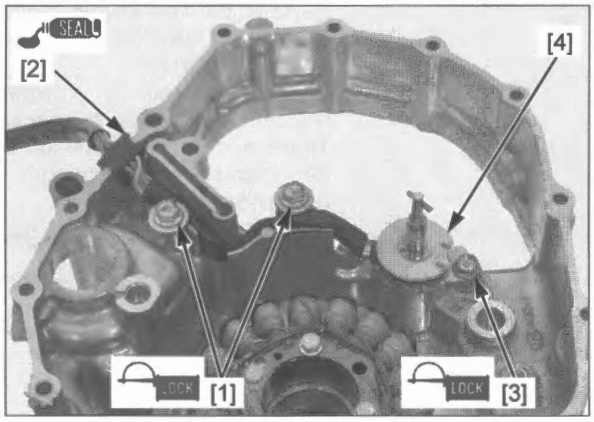


Shift drum position	Connector terminal
5R (5th/Reverse)	Gray
N (Neutral)	Light green/red
12 (1st/2nd)	White/red
N2 (Neutral/2nd)	Black
32 (3rd/2nd)	Yellow
3N (3rd/Neutral)	Red
34 (3rd/4th)	Red/white
N4 (Neutral/4th)	Green/orange
54 (5th/4th)	Blue
5N (5th/Neutral)	Light blue/white

REPLACEMENT

Remove the rear crankcase cover (page 15-8).

Remove the two wire clamp bolts [1].
Remove the wire grommet [2] from the rear crankcase cover.
Remove the retaining bolt [3] and shift drum position switch [4] from the rear crankcase cover.



Apply locking agent to all bolt threads.
Install the shift drum position switch onto the rear crankcase cover and tighten the retaining bolt.

TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)

Apply sealant to the grommet seating surface.
Route the wire as shown and install the grommet into the crankcase cover groove properly.
Install the two clamp bolts and tighten them.

TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)

Install the rear crankcase cover (page 15-14).

REVERSE SWITCH ('15 – '19)

SYSTEM INSPECTION

1. Reverse Switch Inspection at PCM Connector

Turn the ignition switch OFF.
Disconnect the PCM 33P (Black) connector (page 4-45).
Check for continuity between the wire harness side 33P connector [1] terminal and ground in each reverse selector lever position.

TOOL:
Pin Probe Male (2 pack) **07ZAJ-RDJA110**

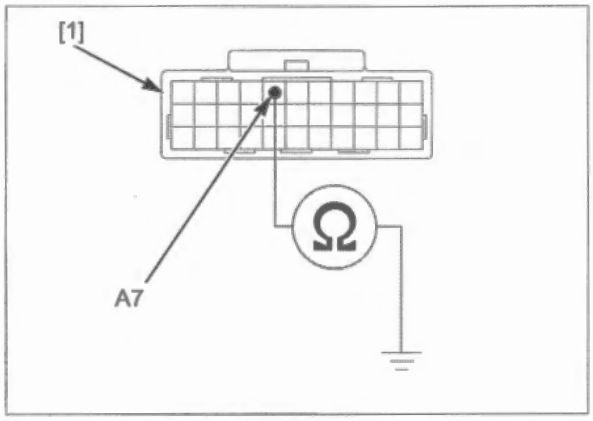
Connection: A7 – ground

There should be continuity with the selector lever depressed and no continuity with the selector lever released.

Are the test results normal?

YES – The system is normal.

NO – GO TO STEP 2.



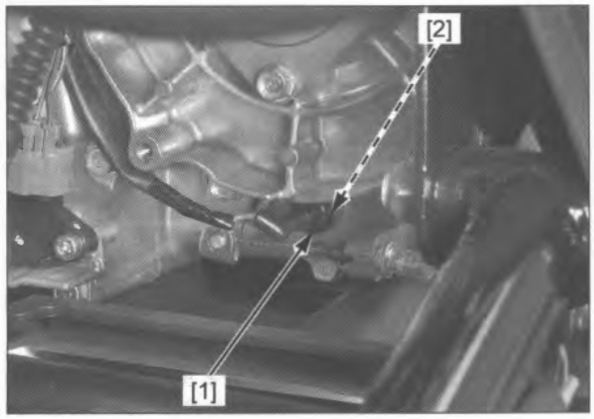
2. Reverse Switch Inspection at Switch

Remove the right center mudguard (page 2-5).
Disconnect the Yellow wire connector [1] from the reverse switch [2].
Check for continuity between the switch terminal and ground in each reverse selector lever position.
There should be continuity with the selector lever depressed and no continuity with the selector lever released.

Are the test results normal?

YES – Open or short circuit in the Yellow wire

NO – Faulty reverse switch

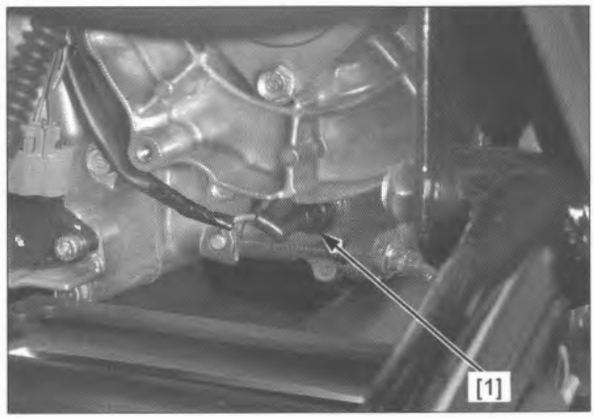


REMOVAL/INSTALLATION

Remove the right center mudguard (page 2-5).

Drain the engine oil (page 3-14).

Disconnect the Yellow wire connector [1] from the reverse switch.



Remove the reverse switch [1] and sealing washer [2].

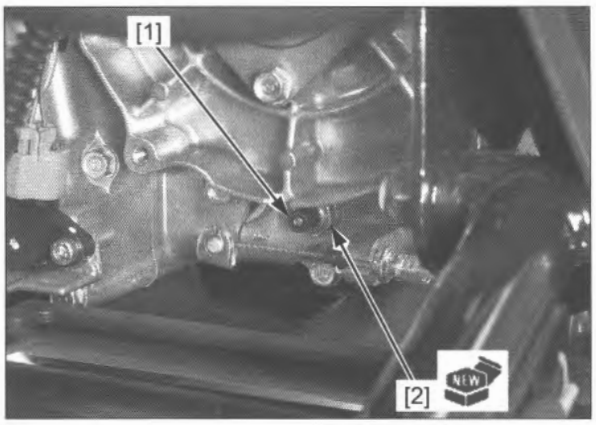
Install the reverse switch with a new sealing washer and tighten it.

TORQUE: 13 N·m (1.3 kgf·m, 10 lbf·ft)

Connect the Yellow wire connector to the reverse switch.

Fill the crankcase with the recommended engine oil (page 3-14).

Install the right center mudguard (page 2-5).



EOT SENSOR

REMOVAL/INSTALLATION

Remove the right center mudguard (page 2-5).

Drain the engine oil (page 3-14).

Disconnect the 2P connector [1] from the EOT sensor [2].
Remove the EOT sensor and sealing washer [3] from the front crankcase cover.

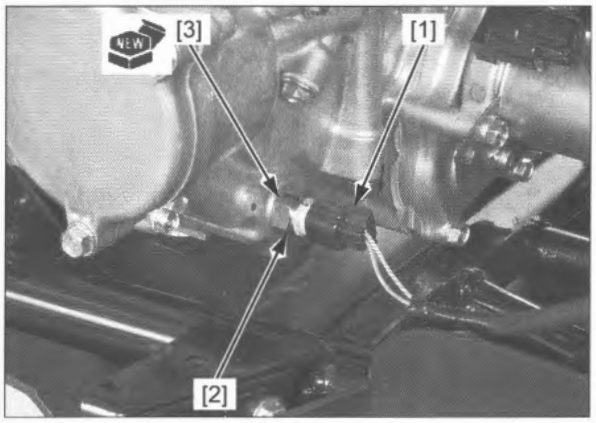
Install the EOT sensor with a new sealing washer and tighten it.

TORQUE:
'15 – '19: 18 N·m (1.8 kgf·m, 13 lbf·ft)
After '19: 14.5 N·m (1.5 kgf·m, 11 lbf·ft)

Connect the 2P connector.

Fill the crankcase with the recommended engine oil (page 3-14).

Install the right center mudguard (page 2-5).



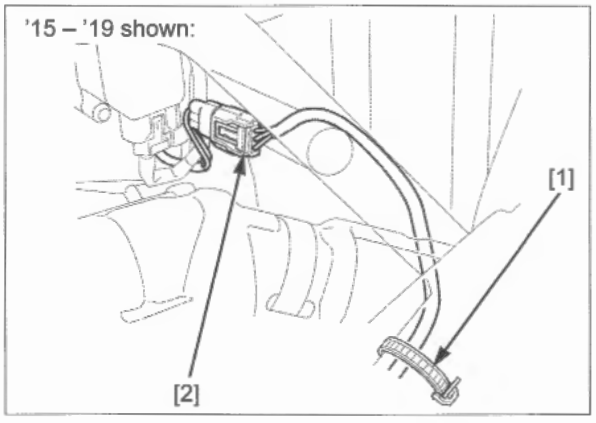
REAR VS SENSOR

REMOVAL/INSTALLATION

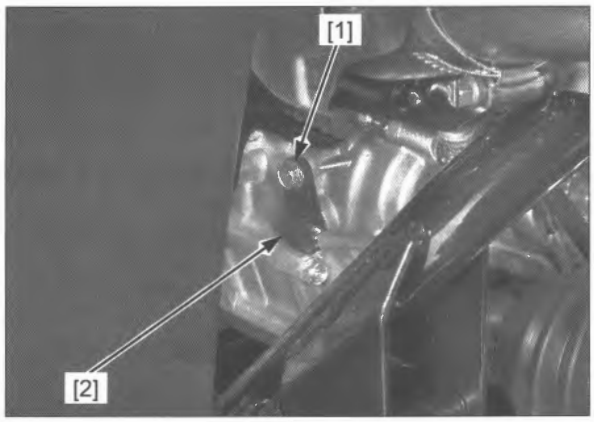
Remove the tank cover assembly (page 2-4).

'15 – '21 models: Remove the wire band [1] and disconnect the rear VS sensor 3P (Black) connector [2].

After' '21 models: Remove the wire band [1] and disconnect the rear VS sensor 4P (Black) connector [2].



Remove the bolt [1] and rear VS sensor [2] from the rear crankcase cover.

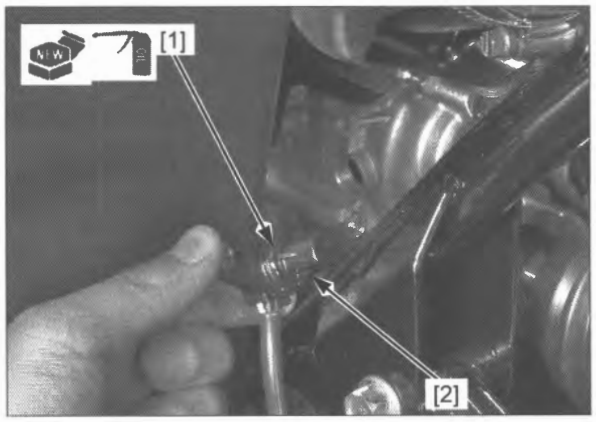


Remove the O-ring [1] from the rear VS sensor [2].

Coat a new O-ring with engine oil and install it onto the rear VS sensor.
Install the rear VS sensor into the rear crankcase cover and tighten the bolt.

Install the removed parts in the reverse order of removal.

TORQUE:
Rear VS sensor mounting bolt:
10 N·m (1.0 kgf·m, 7 lbf·ft)



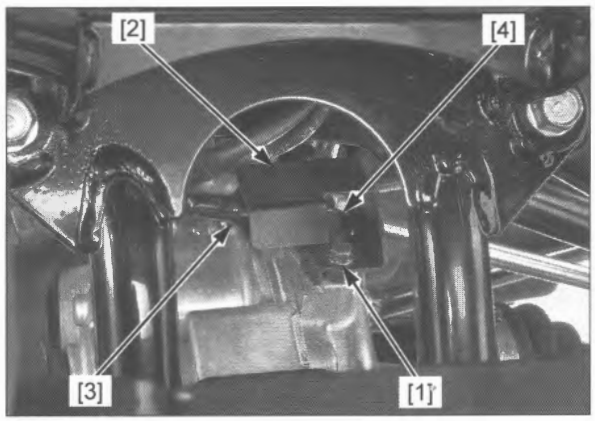
FRONT VS SENSOR

REMOVAL/INSTALLATION

Remove the bolt [1] and guard plate [2].

Disconnect the 3P connector [3] from the front VS sensor [4].

Remove the front VS sensor from the front final gear case.



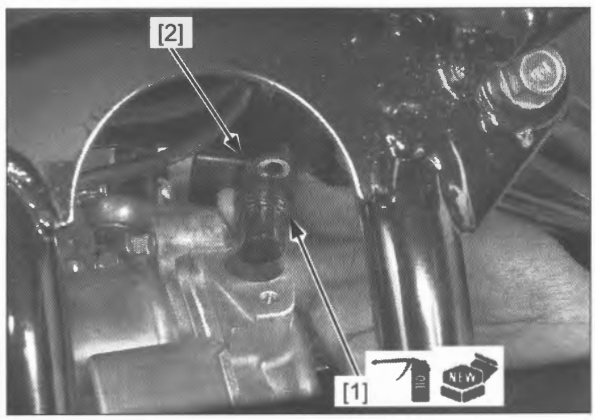
Remove the O-ring [1] from the front VS sensor [2].

Coat a new O-ring with engine oil and install it onto the front VS sensor.

Install the front VS sensor into the front final gear case.

Connect the 3P connector to the front VS sensor.

Install the guard plate and bolt, and tighten the bolt.

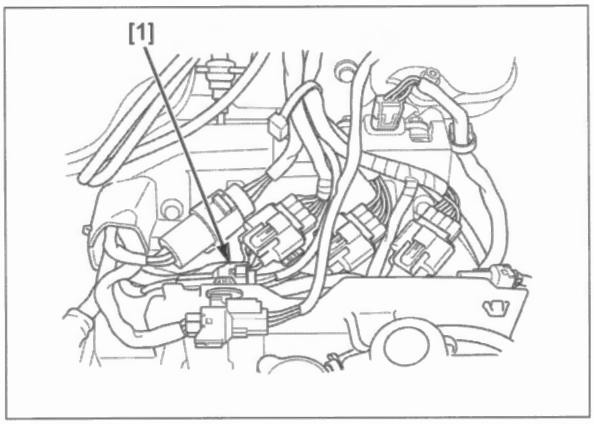


DRIVE MODE SELECT SWITCH

SYSTEM INSPECTION

1. Drive Mode Select Switch Inspection

Raise the front fender (page 24-13).
Disconnect the drive mode select switch 2P (Black) connector [1].
Check for continuity between the switch side connector terminals in each switch position.
There should be continuity with the switch turned to AUTO, and no continuity with the switch turned to ESP.



Is the switch normal?

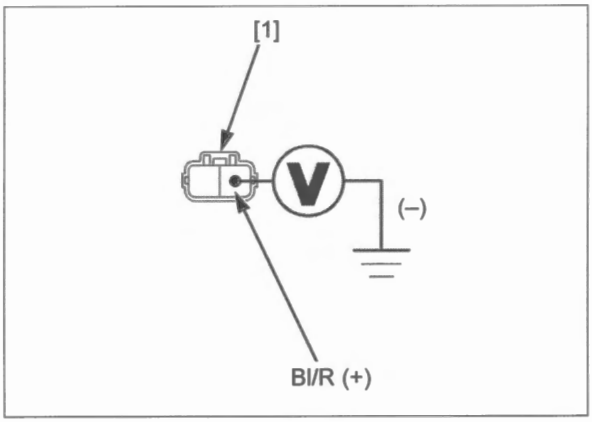
YES – GO TO STEP 2.

NO – Faulty drive mode select switch

2. Power Input Line Open Circuit Inspection

Turn the ignition switch ON.
Measure the voltage between the wire harness side 2P (Black) connector [1] terminal and ground.

Connection: Black/red (+) – ground (–)



Is there battery voltage?

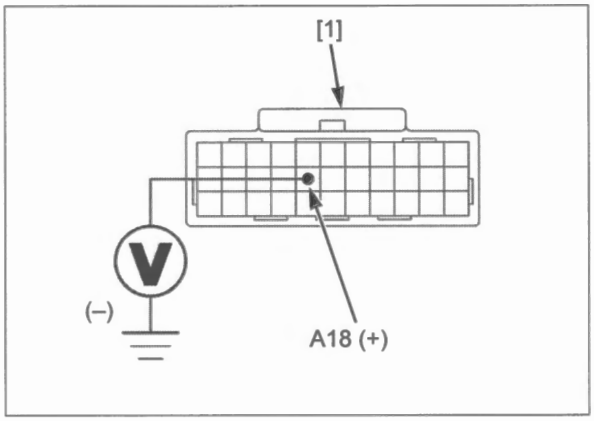
YES – GO TO STEP 3.

NO – Open circuit in the Black/red wire

3. Output Line Open Circuit Inspection

Turn the ignition switch OFF.
Connect the drive mode select switch 2P (Black) connector.
Disconnect the PCM 33P (Black) connector (page 4-45).
Turn the drive mode select switch to AUTO and the ignition witch ON.
Measure the voltage between the wire harness side 33P connector [1] terminal and ground.

TOOL:
Pin Probe Male (2 pack) **07ZAJ-RDJA110**



Connection: A18 (+) – ground (–)

Is there battery voltage?

YES – The system is normal.

NO – Open circuit in the Brown/black wire

SHIFT VALVE BODY

NOTICE

Do not drop or strike the solenoid valves when servicing. Excessive shock may damage the solenoid valve.

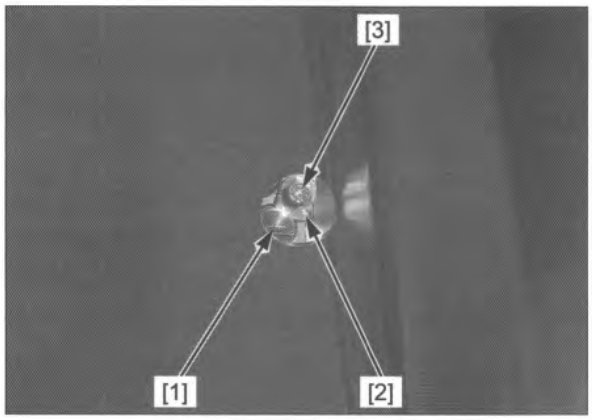
EMERGENCY VALVE FUNCTION

NOTE:

- The emergency valve is used when the hydraulic pressure is shut off by the faulty dual clutch PC solenoid (stuck; mechanical lock), and the vehicle is prevented from running. Open the bypass oil circuit manually to supply hydraulic pressure.

'15 – '19

The stopper bolt [1] that operates the emergency valve is secured with the lock plate [2].
When trouble occurs, loosen the lock plate screw [3] and turn the stopper bolt all the way in to activate the emergency valve.



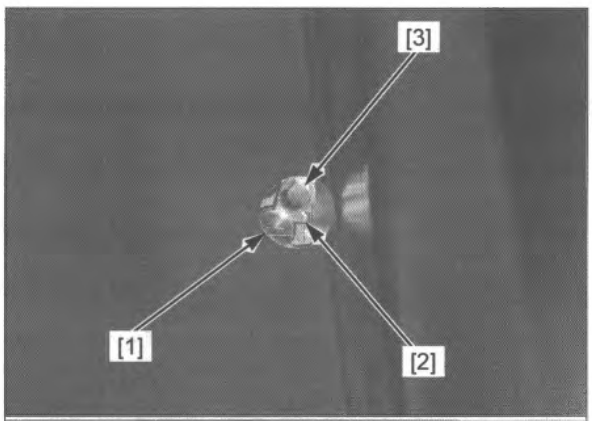
After '19

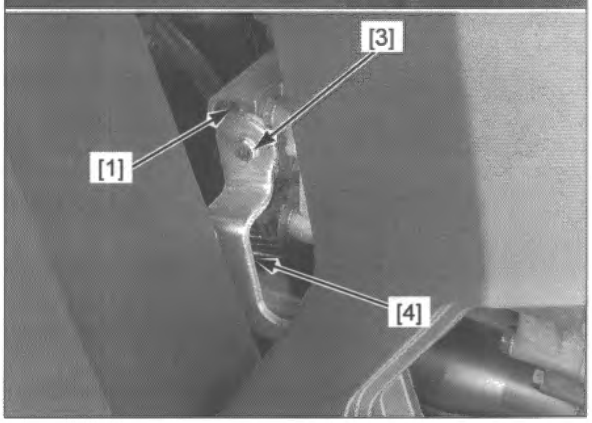
The stopper bolt [1] that operates the emergency valve is secured with the lock plate [2].
When trouble occurs, loosen the lock plate bolt [3].

Remove the oil check lid (page 2-3).

Release the lock plate bolt fixing the lock plate with the gear change lever tool [4].

Turn the stopper bolt all the way in to activate the emergency valve.

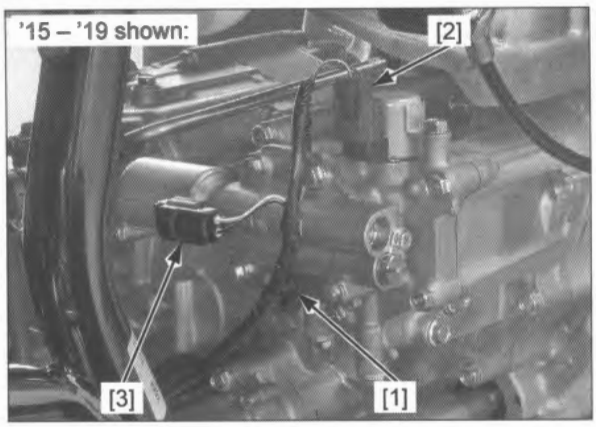




REMOVAL/INSTALLATION

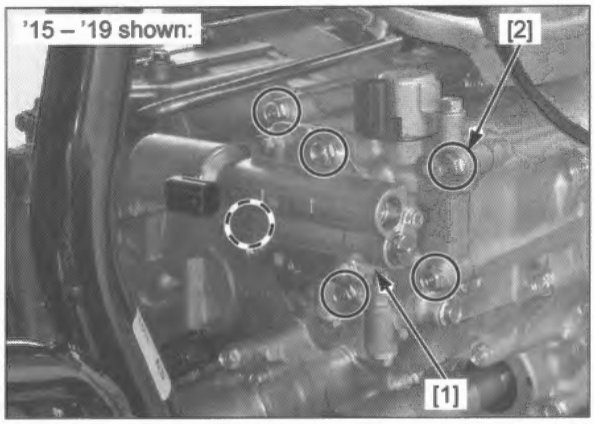
Remove the left center mudguard (page 2-5).

Clean around the valve body with compressed air to remove dust, dirt and foreign material.
Remove the wire clip [1] from the stay.
Disconnect the shift solenoid valve 2P connector [2] and dual clutch PC solenoid valve 2P connector [3].



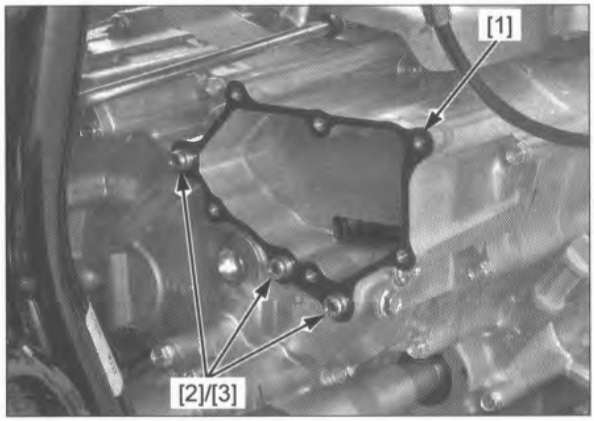
Place a shop towel under the valve body [1].

Remove the following:
- six bolts [2]
- valve body assembly



- gasket [1]
- three oil guide pins [2]
- six O-rings [3] from the guide pins

Cover the shift valve body housing of the front crankcase cover with tape or a clean cloth.

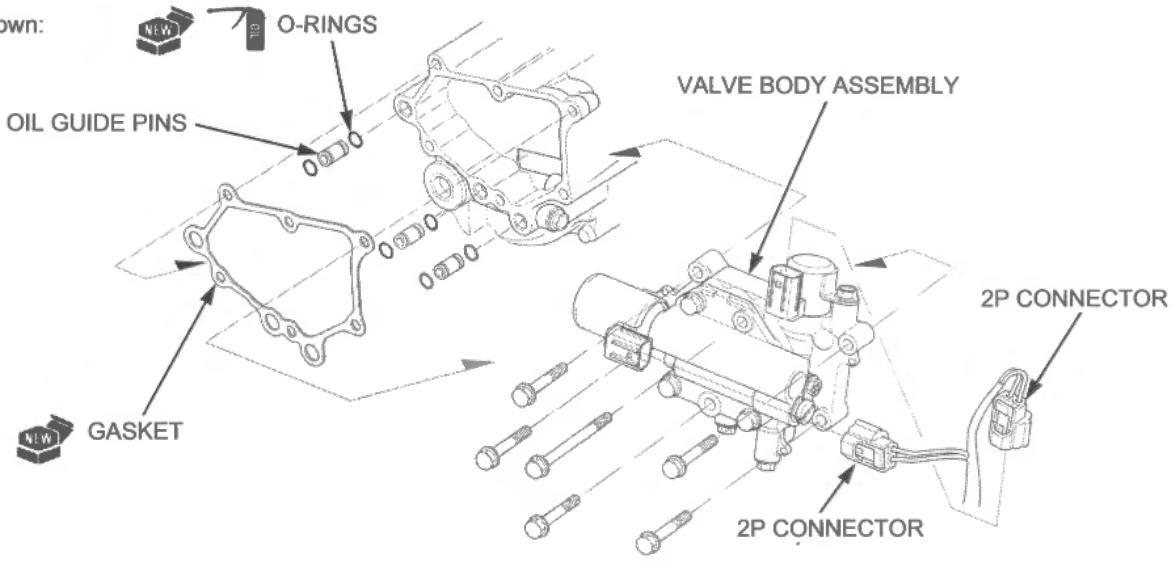


Installation is in the reverse order of removal.

- Replace the O-rings and gasket with new ones.

- Coat the O-rings with engine oil.

'15 – '19 shown:



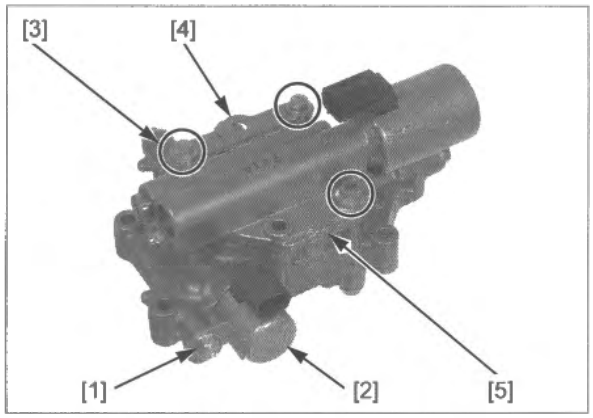
DISASSEMBLY/ASSEMBLY

NOTE:

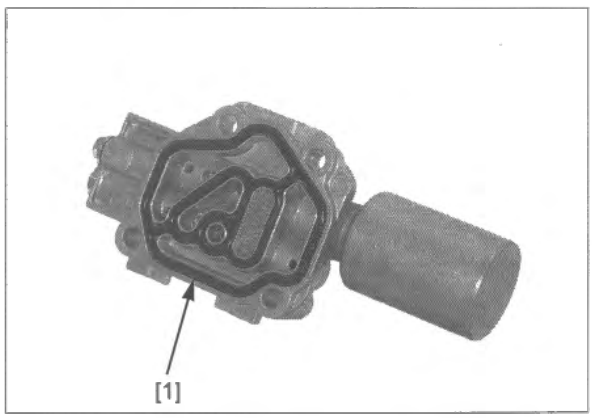
- Keep dust and dirt away from all the parts.
- Take care not to damage the mating surfaces of the valve body components.
- Before assembly, clean all the parts with compressed air. Make sure that there is no dust or lint on any parts.

Remove the following:

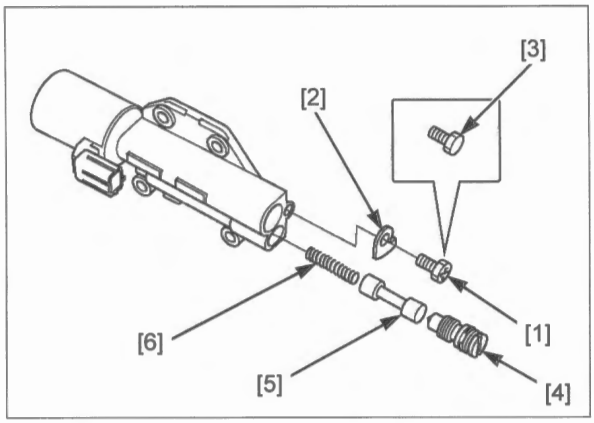
– bolt [1] and shift solenoid valve [2]
– three bolts [3], wire clip stay [4] and dual clutch PC solenoid valve assembly [5]



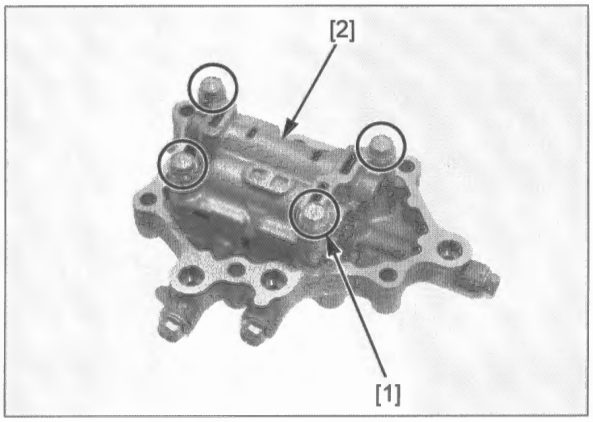
– rubber seal [1]



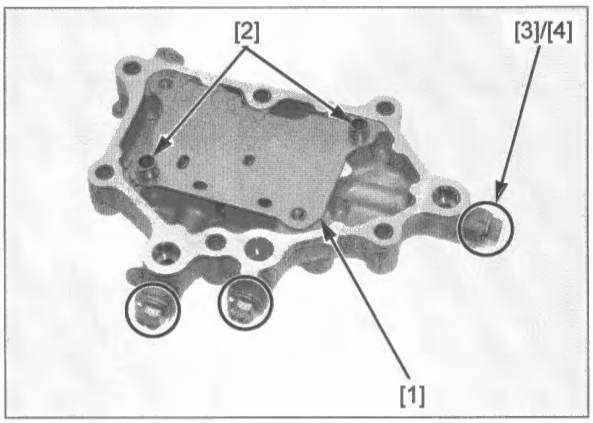
– screw [1] and lock plate [2] ('15 – '19)
– bolt [3] and lock plate (After '19)
– valve stopper bolt [4]
– emergency valve [5]
– valve spring [6]



– four bolts [1]
– valve body [2]

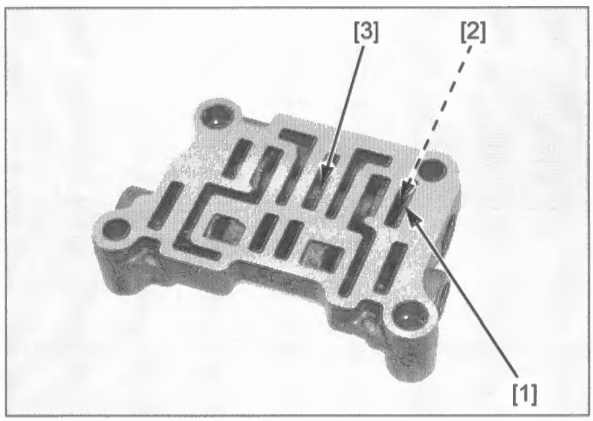


– separator plate [1]
– two dowel pins [2]
– three sealing bolts [3] and washers [4]



– spring seat [1]
– valve spring [2]
– shift valve [3]

Wash all the parts with a high flash point or non-flammable solvent and blow through all oil passages with compressed air to clean completely.

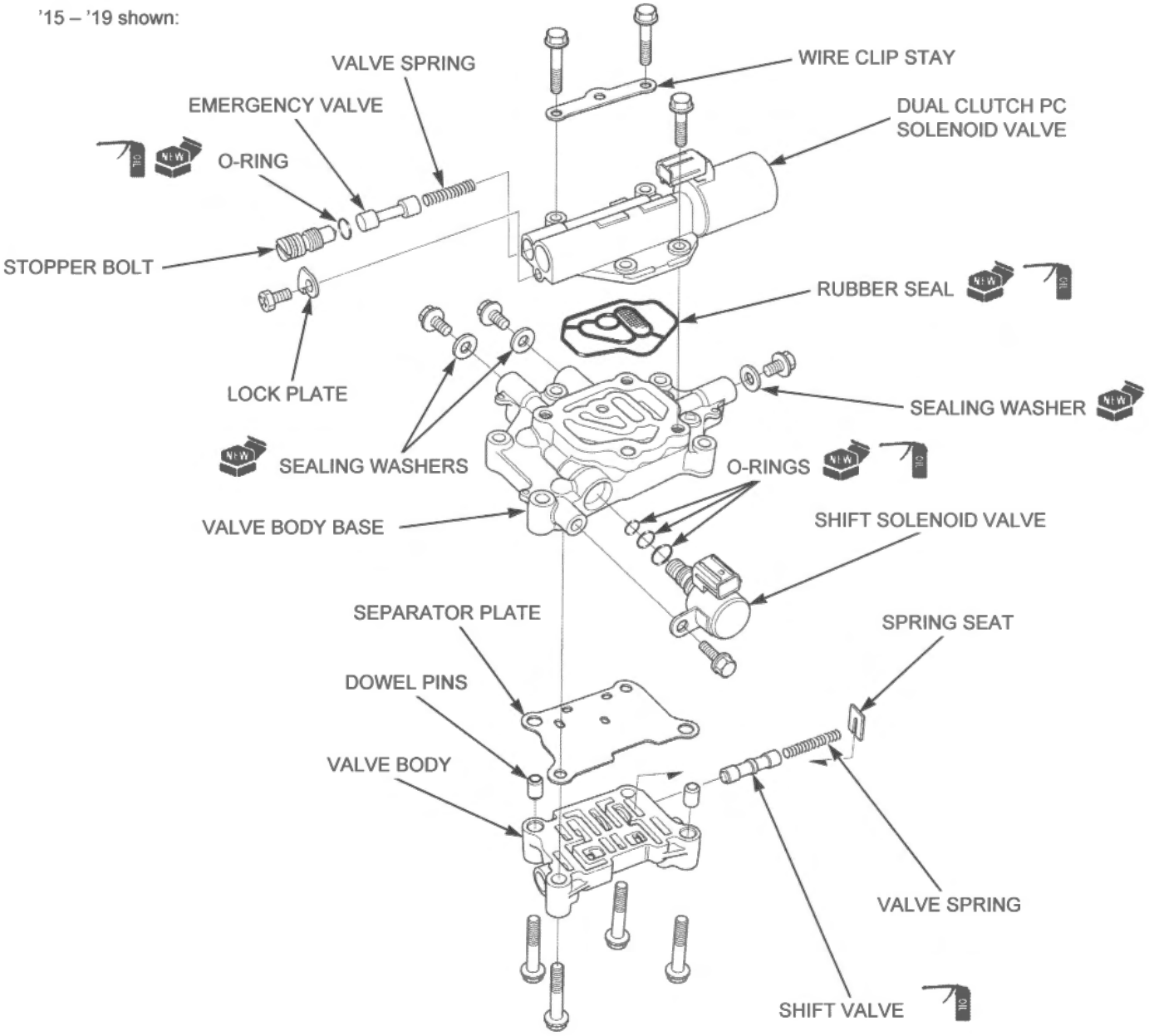


Assembly is in the reverse order of disassembly.

- Replace the O-rings, rubber seal and sealing washers with new ones.
- Coat O-rings and rubber seal with engine oil.

- Apply engine oil to the shift valve outer surface.

'15 – '19 shown:



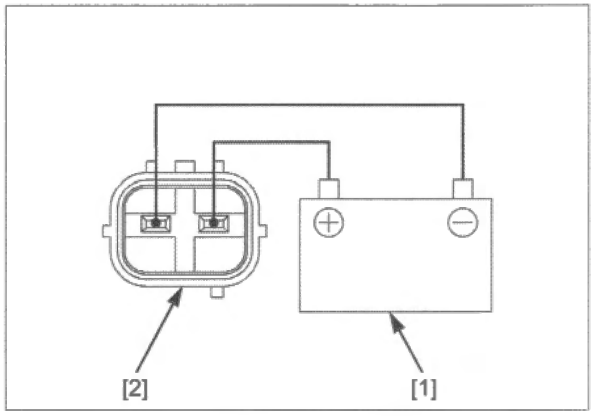
INSPECTION

SHIFT SOLENOID VALVE

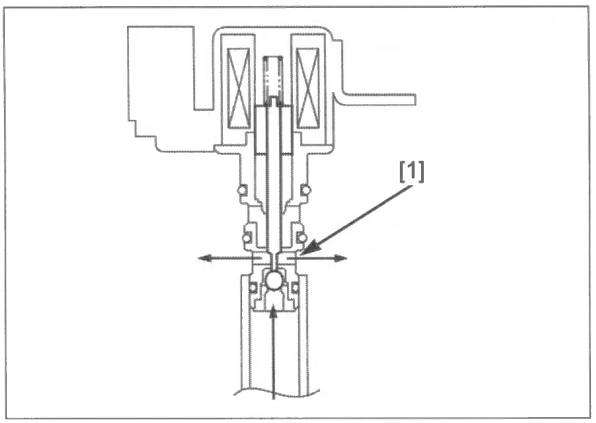
Use a hand-operated air pump only. Do not use a high pressure air source.

Connect a pressure pump to the input port (filter side) of the shift solenoid valve.

Connect a 12 V battery [1] to the shift solenoid valve connector [2] terminals as shown and check for air flow conditions.

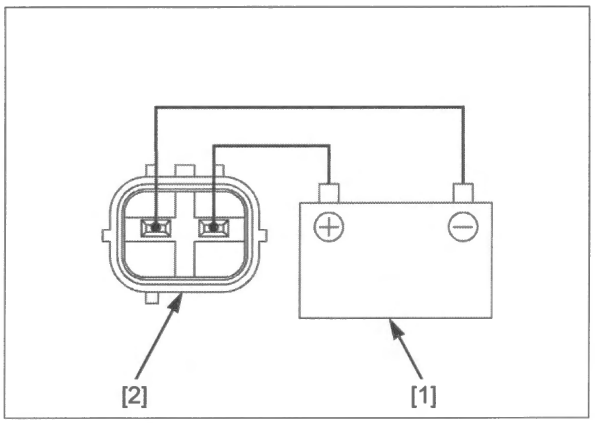


Air should not flow (the pressure should be maintained) while the battery is connected, and should flow out of the output ports [1] that go to the shift valve when the battery is disconnected.

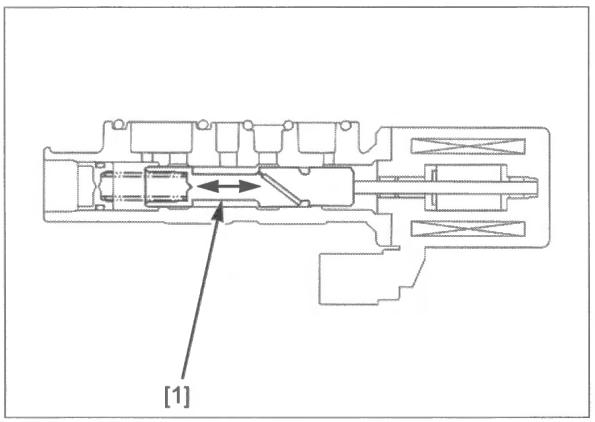


DUAL CLUTCH PC SOLENOID VALVE

Connect a 12 V battery [1] positive terminal to the dual clutch PC solenoid valve connector [2] terminals and check the spool valve through the oil passages for operation.

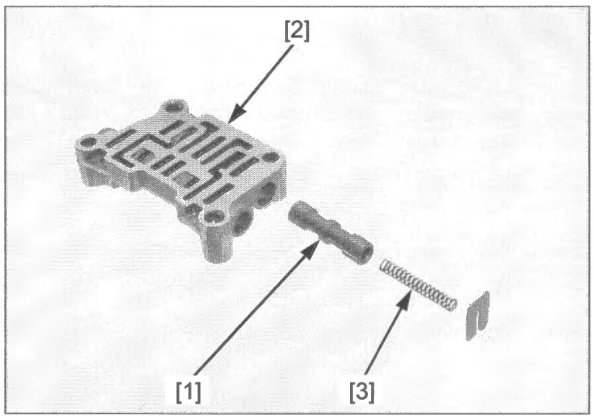


The valve [1] should move to away from the solenoid side when the battery is connected, and should return by spring force when the battery is disconnected.



SHIFT VALVE AND VALVE BODY

Check the shift valve [1] and valve body [2] bore for scoring, scratches or abnormal wear.
Check the valve spring [3] for fatigue or damage.



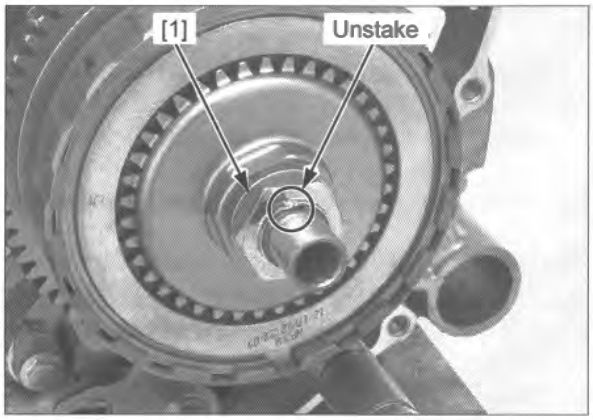
DUAL CLUTCH/PRIMARY DRIVEN GEAR

REMOVAL

Remove the centrifugal clutch (page 13-51).

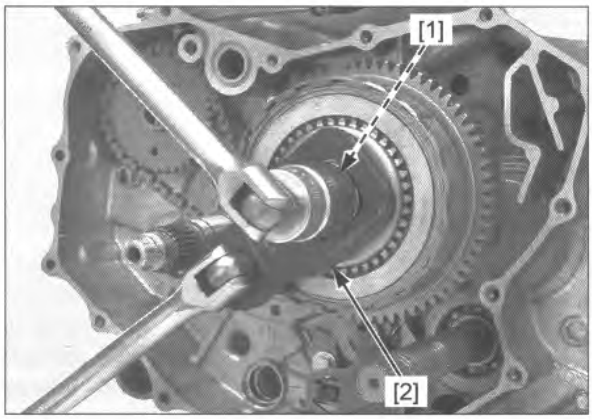
Be careful not to damage the mainshaft threads.

Unstake the lock nut [1].



Loosen the lock nut [1] while holding the gear guide boss with the special tool.

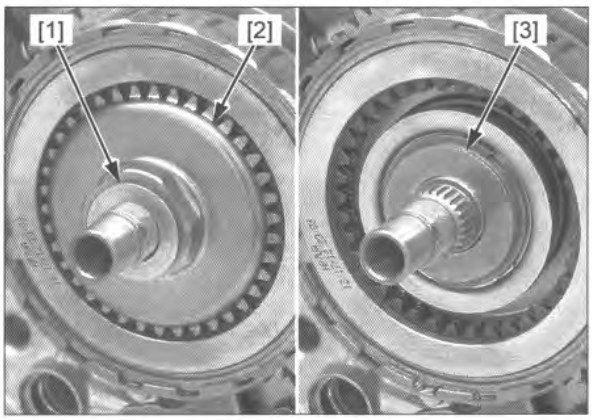
TOOL:
[2] Lock nut wrench, 32.5 mm 07AMA-HP7A100



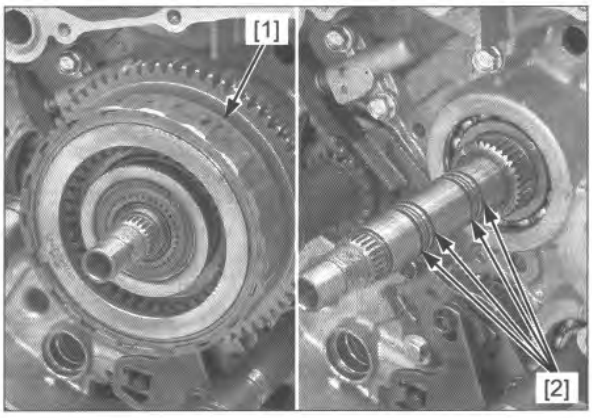
Remove the following

– lock nut

– washer [1]
– 1st clutch gear guide [2]
– thrust washer [3]



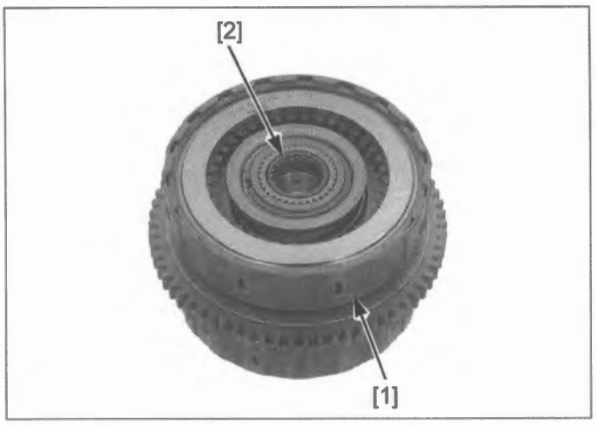
– shift clutch/primary driven gear assembly [1]
– four seal rings [2] from the mainshaft grooves



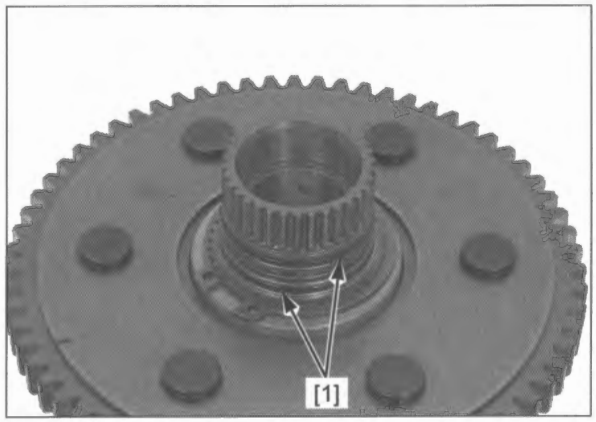
1ST SHIFT CLUTCH DISASSEMBLY

Remove the following:

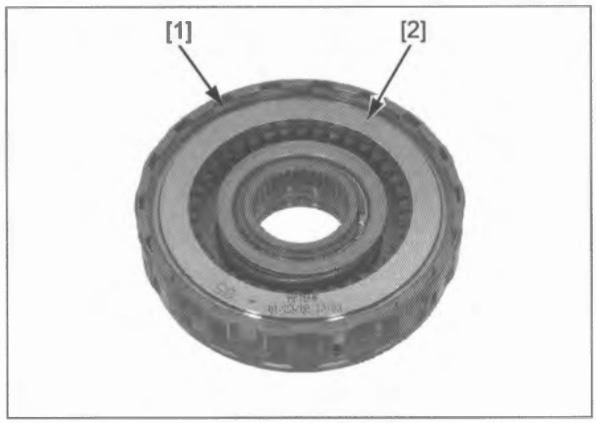
- 1st shift clutch assembly [1]
- needle bearing [2]



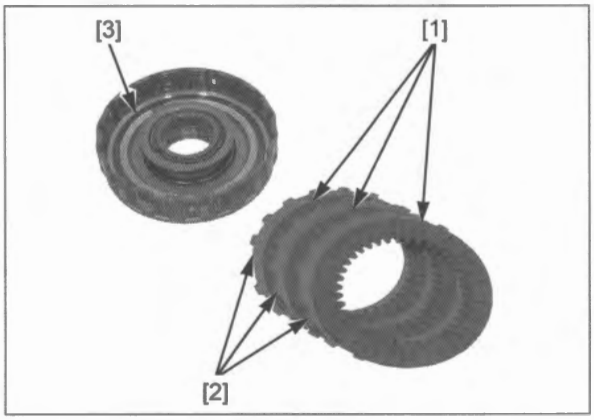
- seal rings [1]



- snap ring [1]
- clutch end plate A [2]



- three clutch discs [1] and plates [2]
- wave spring [3]



If either support block [1] is set over an area of the spring seat [2] that is unsupported by the return spring, the spring seat may be damaged.

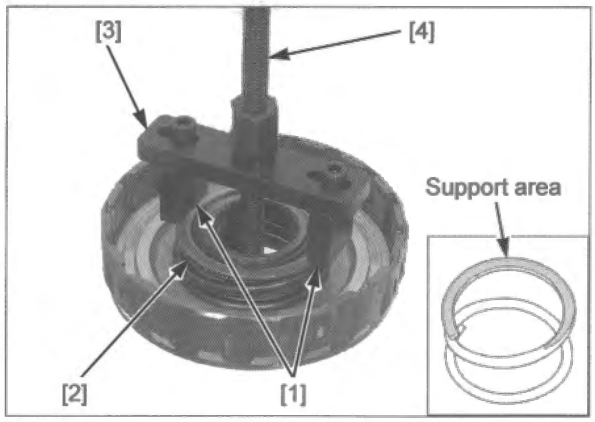
Install the special tools onto the shift clutch.

TOOLS:

Clutch compressor set	**07LAE-PX40000**
or	
[3] Clutch compressor attachment	**07LAE-PX40100 (2 required) and**
[4] Compressor bolt assembly	**07GAE-PG40200 or 07GAE-PG4020A (U.S.A. only)**

NOTE:

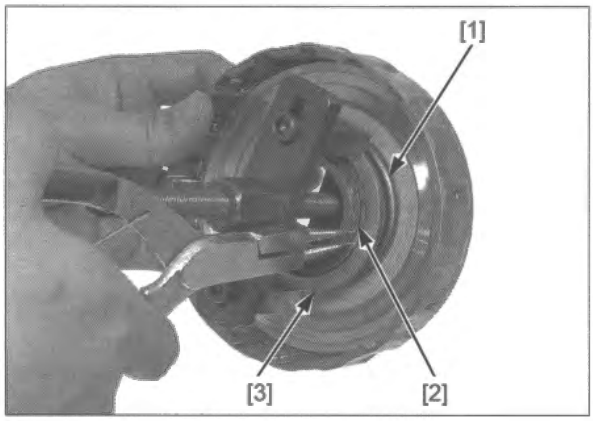
- Be sure the special tool is adjusted to have full contact the stepped areas with the spring seat.



To prevent loss of spring tension, do not compress the spring more than necessary.

Compress the return spring [1] by tightening the nut.
Remove the snap ring [2] from the boss.

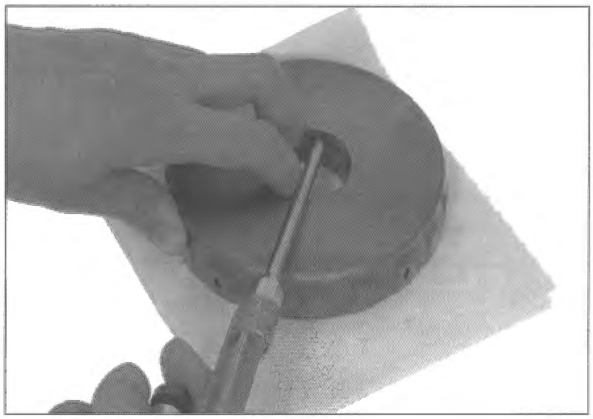
Loosen the nut and remove the special tools, snap ring, spring seat [3] and return spring.



Wrap a shop towel around the clutch drum.
Apply air pressure to the oil hole while closing the other holes with your finger to remove the clutch piston.

Remove the O-rings from the clutch piston.

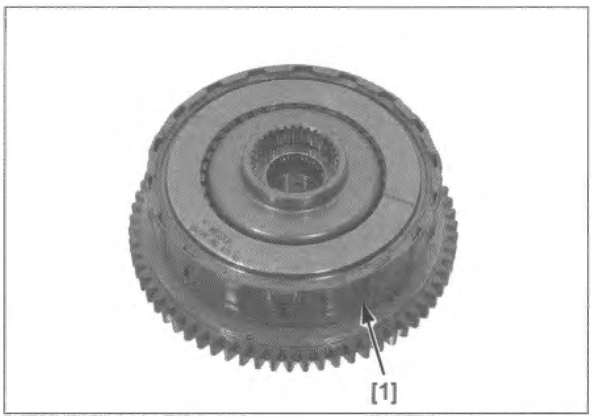
Clean all the parts of the shift clutch in solvent thoroughly and blow dry them with compressed air.



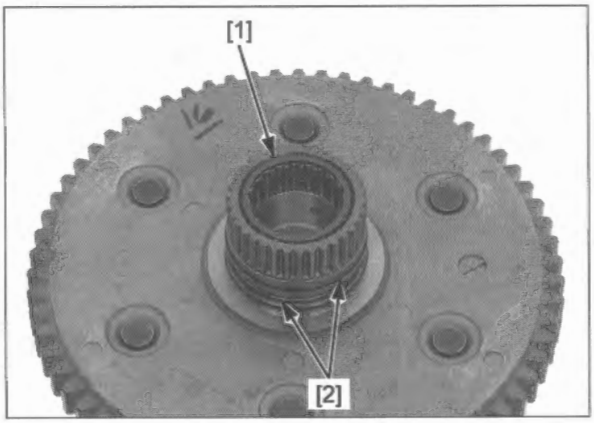
2ND SHIFT CLUTCH DISASSEMBLY

Remove the following:

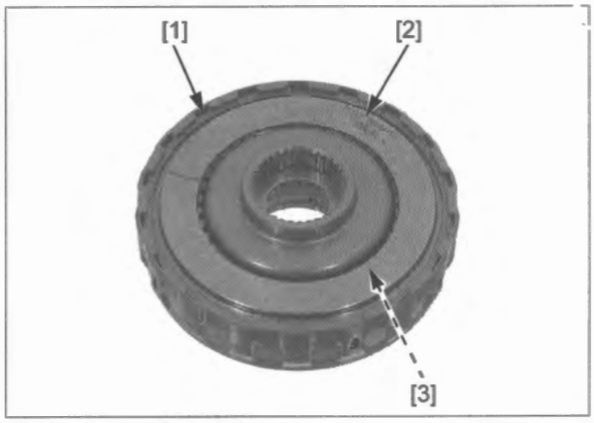
– 2nd shift clutch assembly [1]



– needle bearing [1]
– seal rings [2]



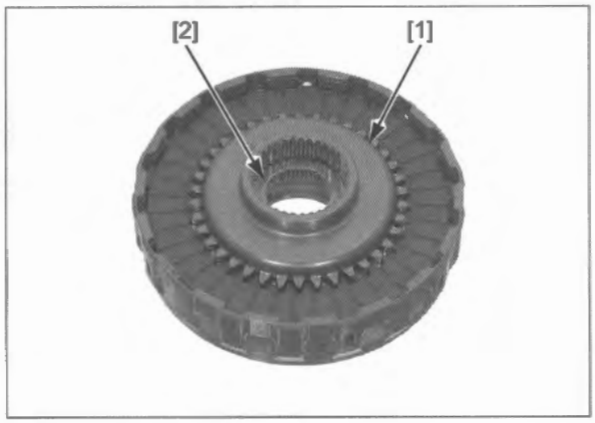
– snap ring [1]
– clutch end plate B [2]
– clutch guide plate A [3]



– 2nd clutch gear guide [1]
– thrust washer [2]

Remove the following in the same procedures as the 1st shift clutch (page 13-75):

– three clutch discs and plates
– wave spring
– snap ring
– spring seat
– return spring
– clutch piston



INSPECTION

Inspect the following parts for scratches, damage, abnormal wear and deformation. Replace if necessary.

- clutch drum and clutch piston
- clutch spring
- clutch discs/plates
- primary driven gear

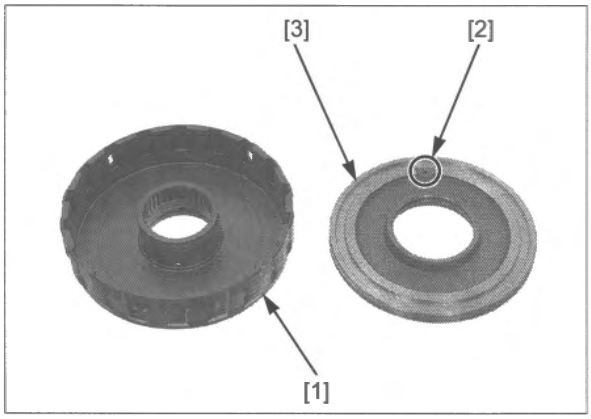
Measure each part according to DUAL CLUTCH TRANSMISSION SPECIFICATIONS (page 1-13). Replace any part if it is out of service limit.

- Replace the clutch discs and plates as a set.

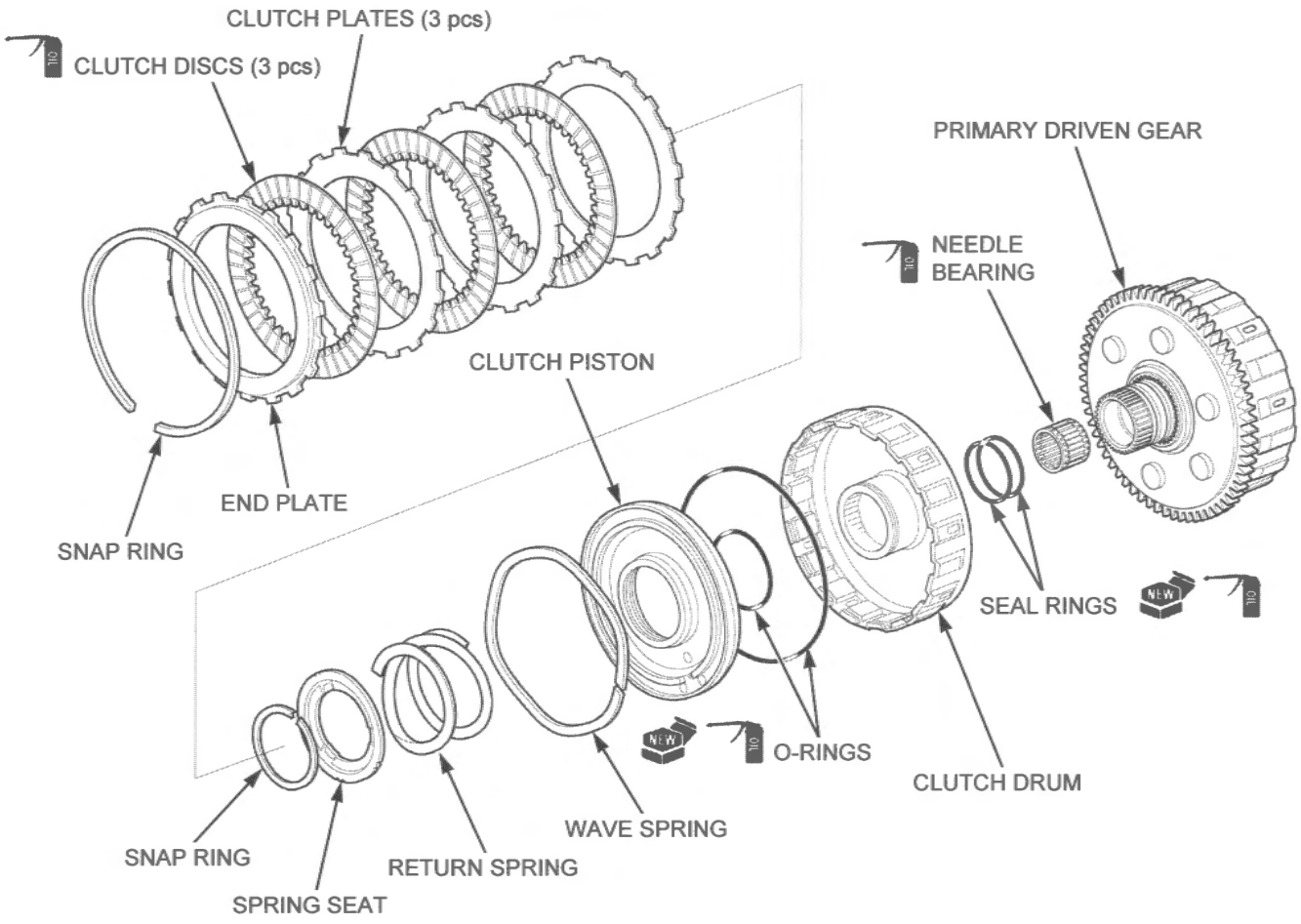
CLUTCH DRUM AND CLUTCH PISTON

Check the clutch drum [1] for nicks, indentations or abnormal wear made by the clutch plates.

Check the oil holes in the drum boss and check valve [2] in the clutch piston [3] for clogs.



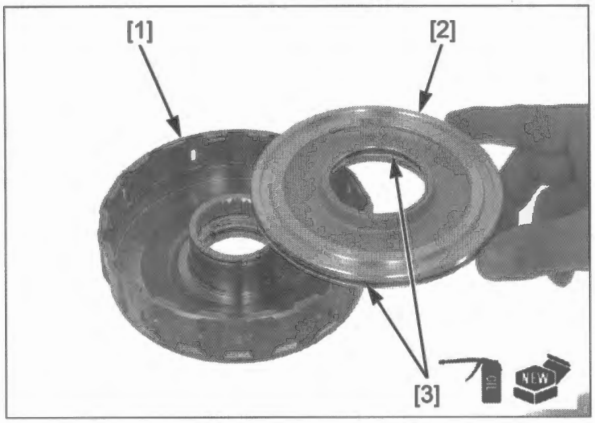
1ST SHIFT CLUTCH ASSEMBLY



Clean the inner surface of the clutch drum [1] thoroughly and blow through the oil holes in the drum boss and check valve in the clutch piston [2].

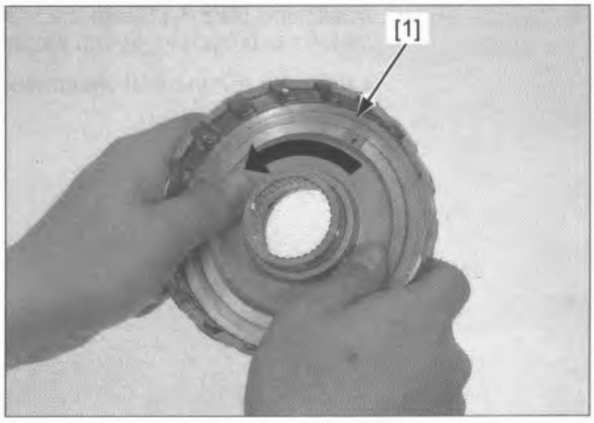
Apply engine oil to new O-rings [3] and install them into the clutch piston groove.

Place the clutch piston into the clutch drum with the flat side facing in.



Be careful not to pinch the O-rings with too much force.

Install the clutch piston [1] while turning it to ensure proper seating.

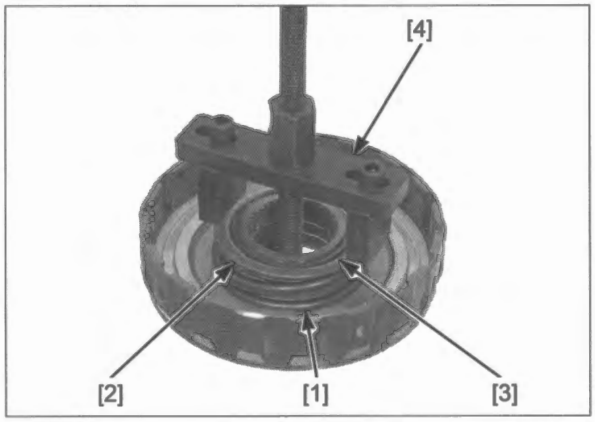


Place the return spring [1], spring seat [2] and snap ring [3] into the clutch drum.

Install the special tools [4] while adjusting their position carefully (page 13-76).

To prevent loss of spring tension, do not compress the spring more than necessary.

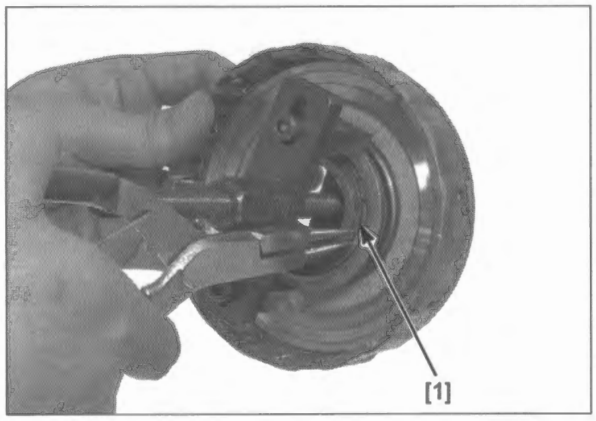
Compress the return spring by tightening the nut.



Align the end gap with the groove (3 places) in the spring seat.

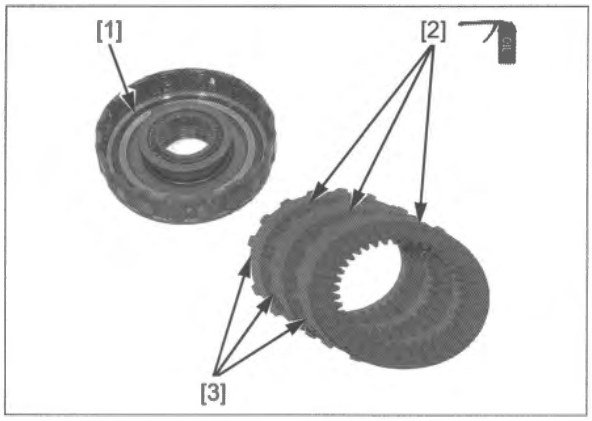
Install the snap ring [1] into the groove in the drum boss properly.

Loosen the nut and remove the special tools.



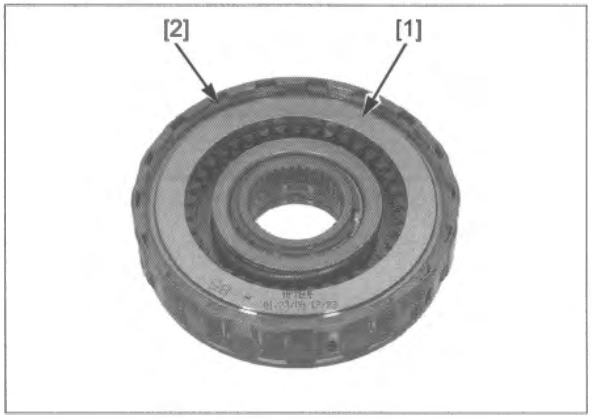
Install the wave spring [1] into the clutch piston groove.

Coat the clutch discs [2] with engine oil.
Install the three clutch plates [3] and discs alternately, starting with the plate.

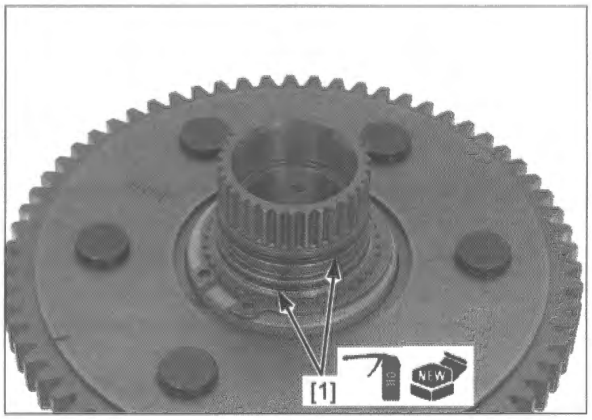


Install end plate A [1] with the stepped side facing out.
Install the snap ring [2] into the drum grooves properly.

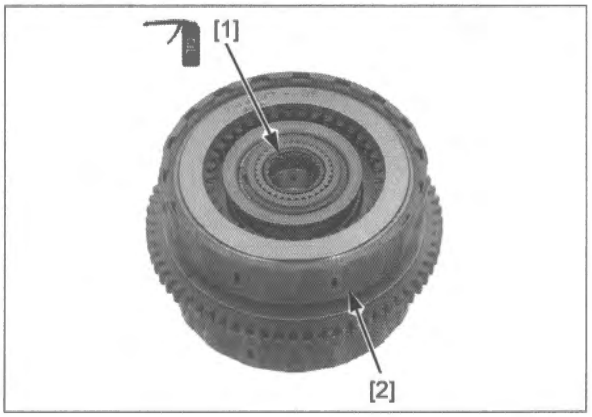
Check the clutch initial clearance (page 13-82).



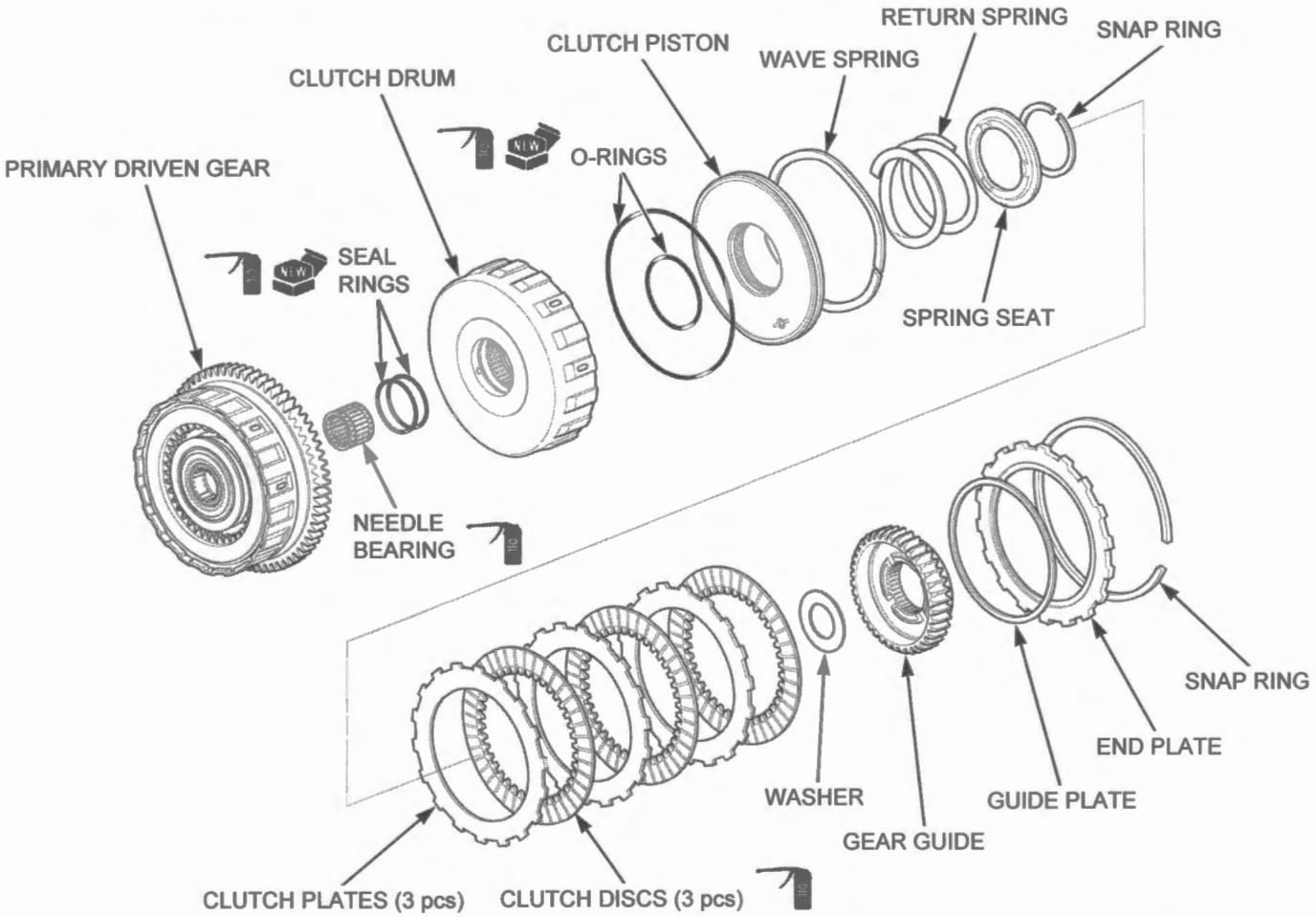
Coat new seal rings [1] with engine oil and install them into the primary driven gear grooves.



Apply engine oil to the needle bearing [1] and install it into the primary driven gear.
Install the 1st shift clutch assembly [2] onto the primary driven gear by aligning the splines.



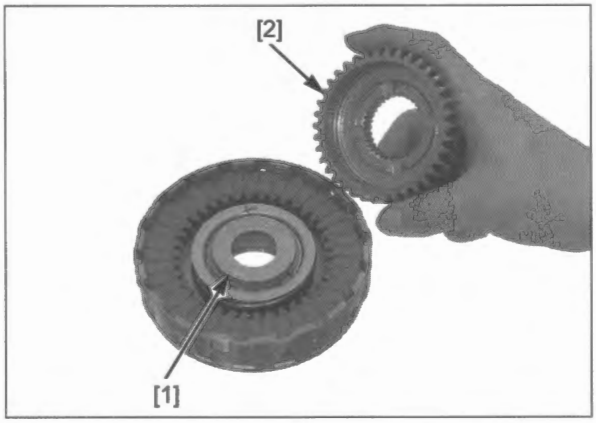
2ND SHIFT CLUTCH ASSEMBLY



Install the following in the same procedures as the 1st shift clutch (page 13-78):

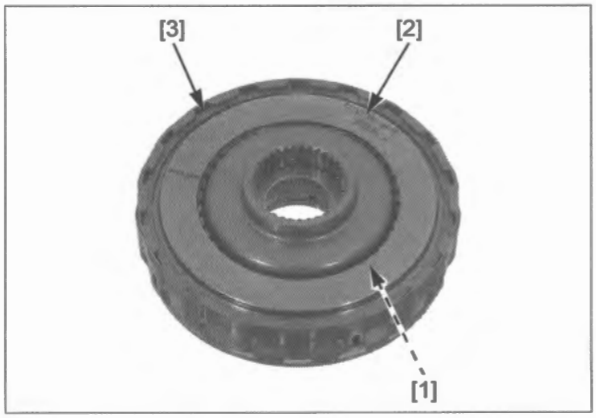
- clutch piston
- return spring
- spring seat
- snap ring
- wave spring
- three clutch plates and discs

Install the thrust washer [1] onto the clutch drum.
Install the 2nd clutch gear guide [2] by aligning the gear guide teeth with the clutch discs tabs.



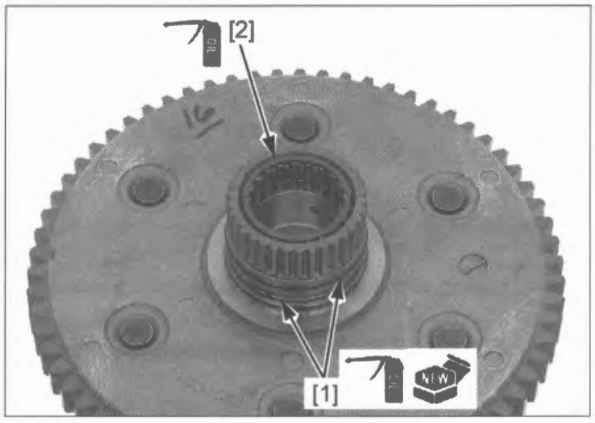
Install clutch guide plate A [1] and clutch end plate B [2].
Install the snap ring [3] into the drum grooves properly.

Check the clutch initial clearance (page 13-82).

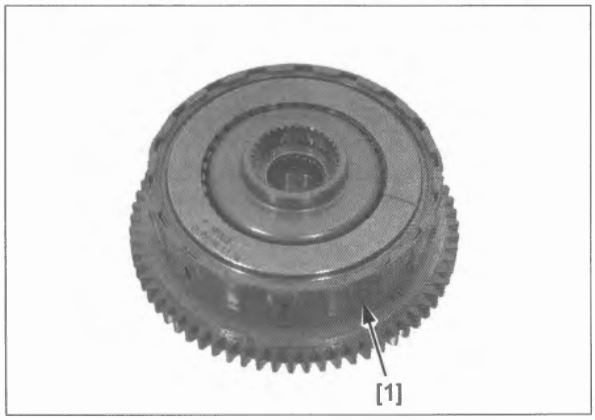


Coat new seal rings [1] with engine oil and install them into the primary driven gear grooves.

Apply engine oil to the needle bearing [2] and install it into the primary driven gear.



Install the 2nd shift clutch assembly [1] onto the primary driven gear by aligning the splines.



CLUTCH INITIAL CLEARANCE CHECK

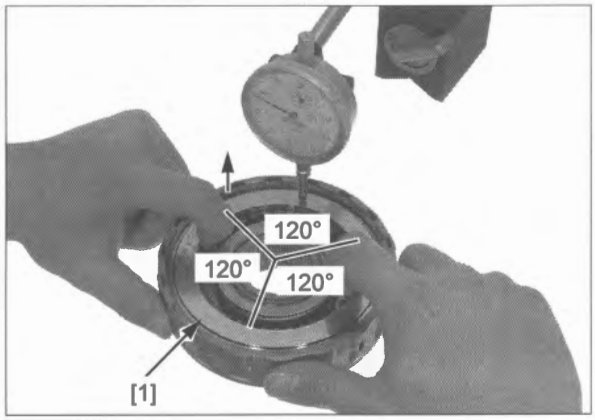
Set a dial indicator on the end plate [1] with the plate lowered.
Lift the end plate up against the snap ring and read the clearance, and record it.

Perform this inspection at the three points in 120° apart.

STANDARD:

1st clutch: 0.70 – 0.90 mm (0.028 – 0.035 in)
2nd clutch: 0.65 – 0.95 mm (0.026 – 0.037 in)

If the clearance is not within the standard value, select the replacement end plate as follows:



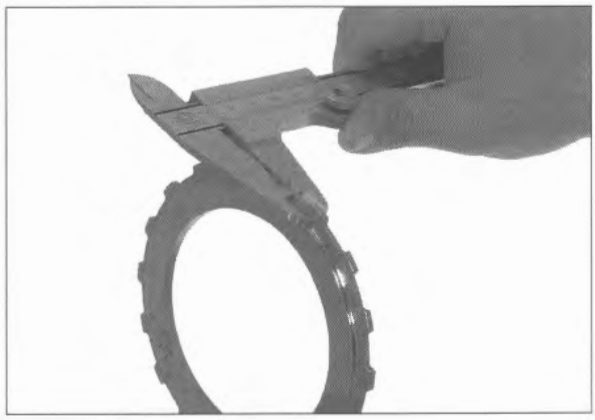
Remove the snap ring and end plate.

Measure the flange thickness of the end plate at several points and record it.

Calculate the new plate thickness using the equation below. Choose a new plate as close to this dimension as possible.

A = (B – 0.8) + C

A: New plate thickness
B: Recorded clearance
C: Old plate thickness



If the calculated dimension is over the thickest plate thickness, replace the clutch discs and plates as a set.

Select the end plate from the table below.

1ST CLUTCH		2ND CLUTCH	
Mark	Thickness	Mark	Thickness
1	1.9 mm	1.9	1.9 mm
2	2.0 mm	2.0	2.0 mm
3	2.1 mm	2.1	2.1 mm
4	2.2 mm	2.2	2.2 mm
5	2.3 mm	2.3	2.3 mm
6	2.4 mm	2.4	2.4 mm
7	2.5 mm	2.5	2.5 mm
8	2.6 mm	2.6	2.6 mm
9	2.7 mm	2.7	2.7 mm

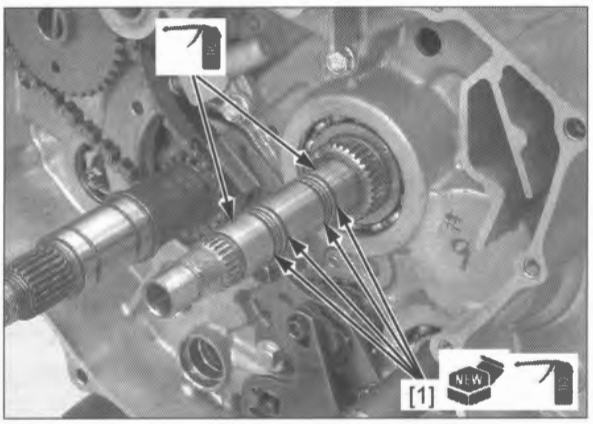
Install the end plate into the drum.
Install the snap ring into the drum grooves properly.

INSTALLATION

Blow through the oil passages in the mainshaft with compressed air.

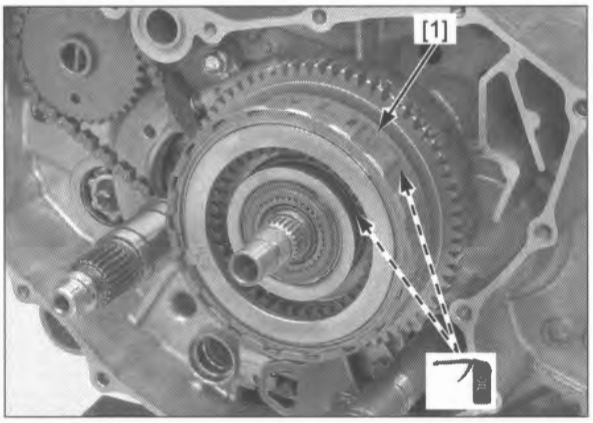
Coat new seal rings [1] with engine oil and install them into the mainshaft grooves.

Apply engine oil to the dual clutch rolling surface of the mainshaft.

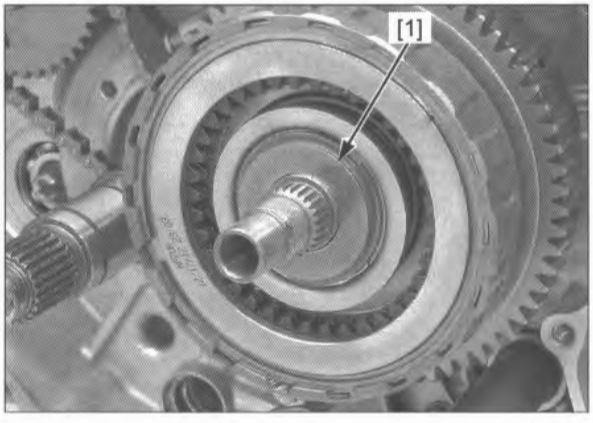


Apply engine oil to the needle bearings in the primary driven gear.

Install the shift clutch/primary driven gear assembly [1] by aligning the splines of the 2nd clutch gear guide and mainshaft.

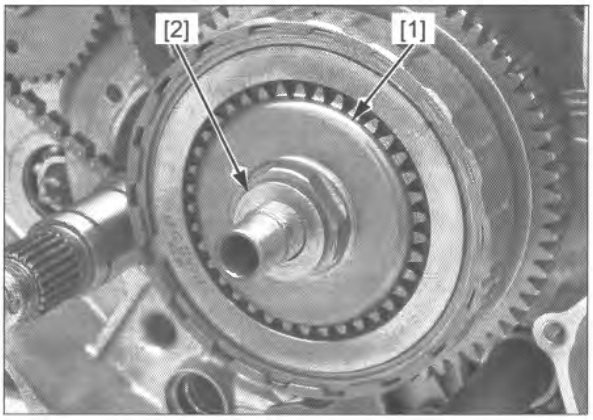


Install the thrust washer [1] onto the mainshaft.



Install the 1st clutch gear guide [1] by aligning the gear guide teeth with the clutch disc tabs, and also aligning the splines of the gear guide and mainshaft, until it is fully seated.

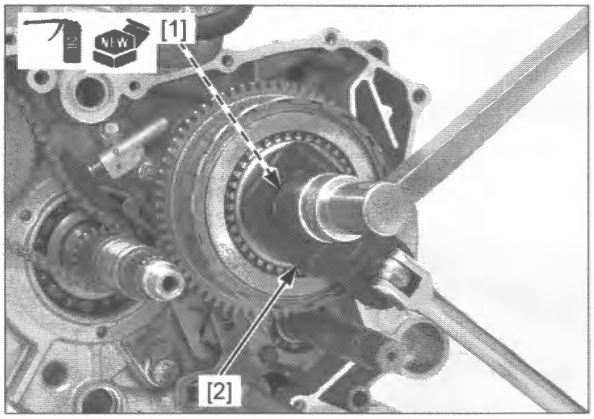
Install the washer [2].



Apply engine oil to new lock nut [1] threads and install it onto the mainshaft.
Tighten the lock nut while holding the gear guide boss with the special tool.

TOOL:
[2] Lock nut wrench, 32.5 mm 07AMA-HP7A100

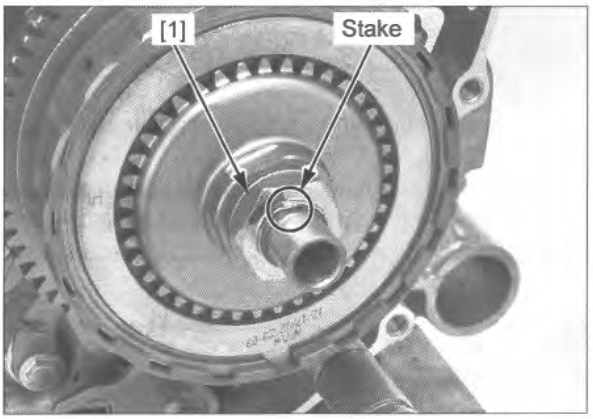
TORQUE: 108 N·m (11.0 kgf·m, 80 lbf·ft)



Be careful not to damage the mainshaft threads.

Stake the lock nut [1] into the mainshaft groove.

Install the centrifugal clutch (page 13-56).

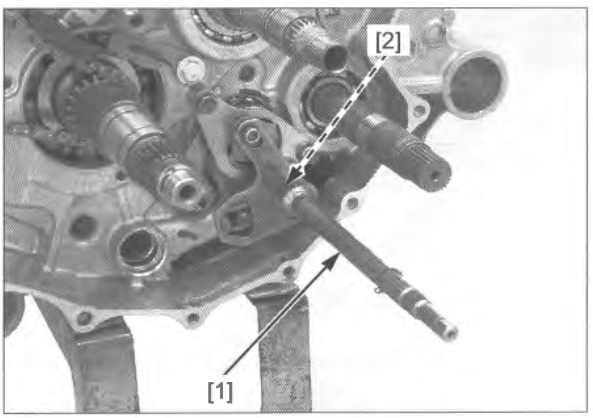


GEARSHIFT LINKAGE

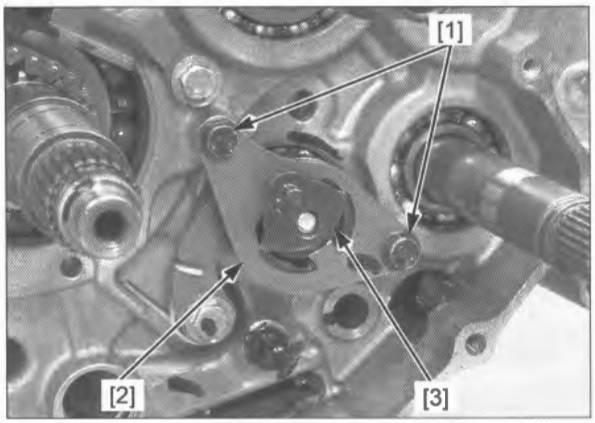
REMOVAL

Remove the following:

- shift spindle angle sensor (page 13-57)
- front crankcase cover/spacer (page 13-44)
- shift clutch/primary driven gear assembly (page 13-74)
- gearshift spindle assembly [1] and washer [2]



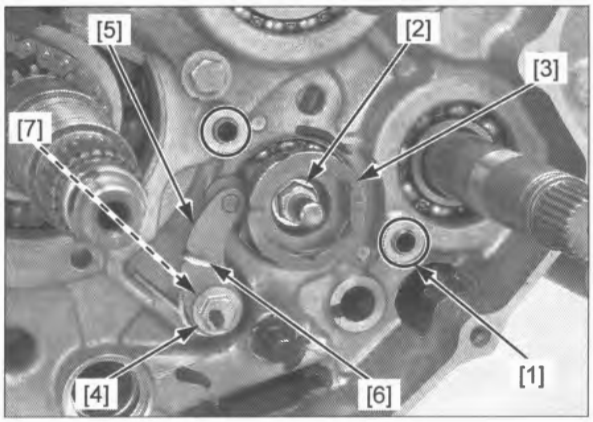
– two bolts [1]
– guide plate [2] and drum shifter assembly [3]



Shift the transmission into reverse when loosening the center bolt.

– two dowel pins [1]
– shift drum center bolt [2]
– shift drum center [3]
– pivot bolt [4], stopper arm [5], return spring [6] and washer [7]

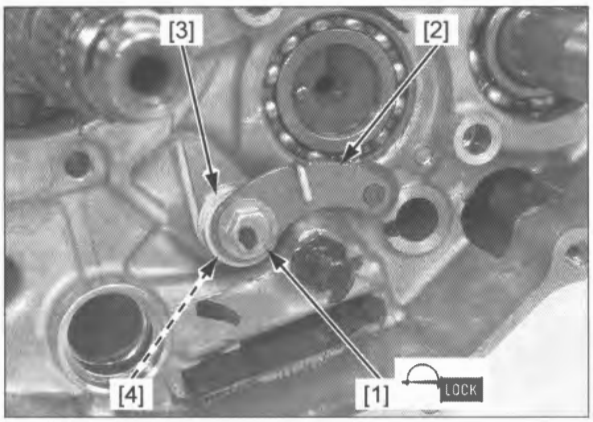
Check all parts for wear or damage.



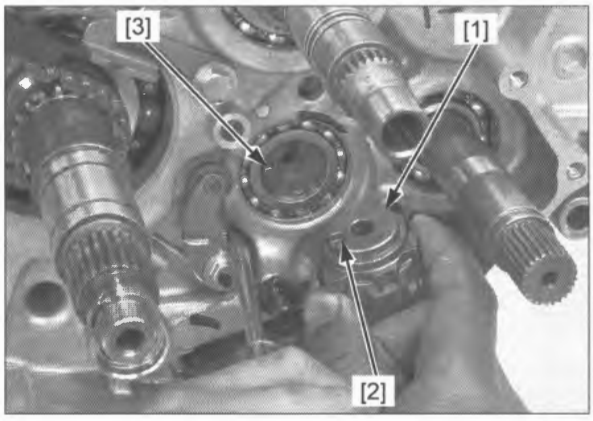
INSTALLATION

Apply locking agent to the stopper arm pivot bolt [1] threads (page 1-20).
Install the stopper arm [2], return spring [3], washer [4] (between the arm and crankcase) and pivot bolt as shown.
Tighten the pivot bolt.

TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)



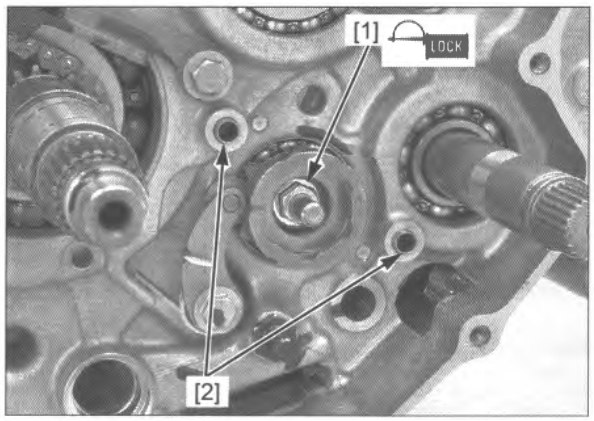
Hold the stopper arm with a screwdriver and install the shift drum center [1] by aligning the pin groove [2] with the dowel pin [3].



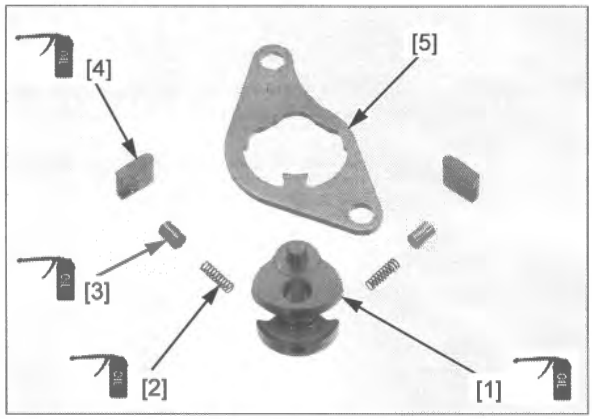
Apply locking agent to the shift drum center bolt [1] threads (page 1-20).
Install the bolt and tighten it.

TORQUE:
'15 – '19: 23 N·m (2.3 kgf·m, 17 lbf·ft)
After '19: 31 N·m (3.2 kgf·m, 23 lbf·ft)

Install the two dowel pins [2].

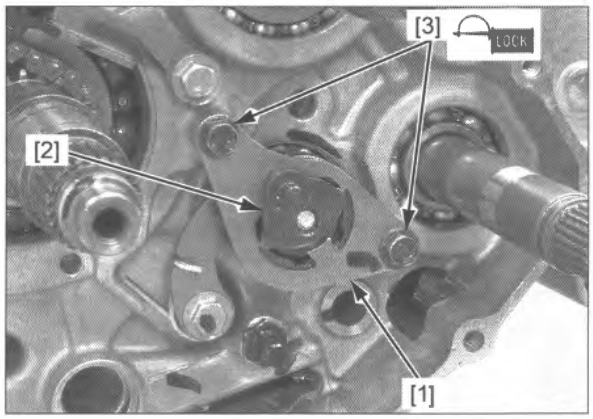


Apply engine oil to the drum shifter [1], springs [2], plungers [3] and ratchet pawls [4], and assemble them with the guide plate [5].



Install the guide plate [1] and drum shifter assembly [2] into the shift drum center and onto the dowel pins as shown.
Apply locking agent to the guide plate bolt [3] threads (page 1-20).
Install the bolts and tighten them.

TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)

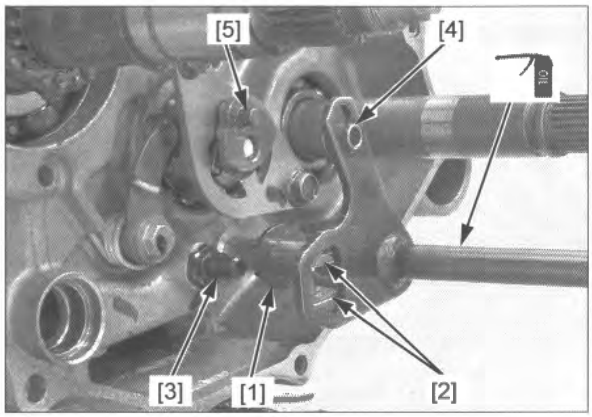


Apply engine oil to the gearshift spindle journal.

Install the washer [1] onto the gearshift spindle and insert the spindle into the crankcase while aligning the return spring ends [2] with the spring pin [3], and the shifter collar [4] with the drum shifter pin [5].

Install the following:

- shift clutch/primary driven gear assembly (page 13-83)
- front crankcase cover/spacer (page 13-47)
- shift spindle angle sensor (page 13-57)

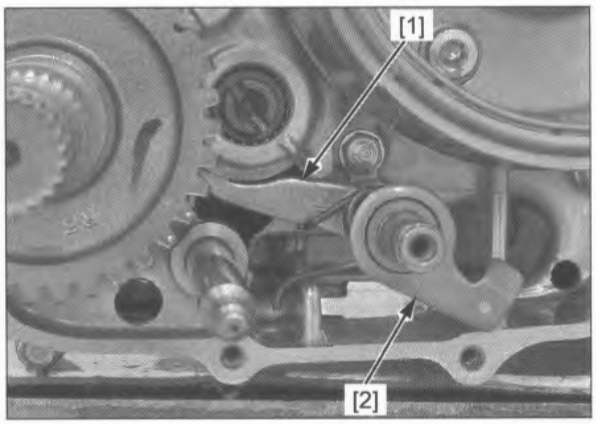


REVERSE STOPPER SHAFT ('15 – '19)

REMOVAL

Remove the rear crankcase cover (page 15-8).

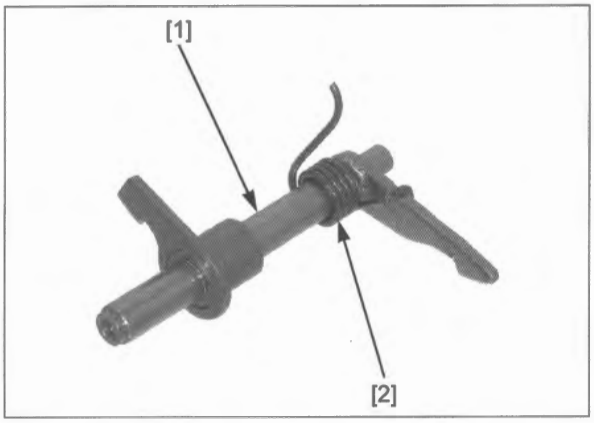
Release the reverse stopper arm [1] from the shift drum groove and remove the stopper shaft assembly [2] from the crankcase.



INSPECTION

Check the reverse stopper shaft [1] for wear or damage.

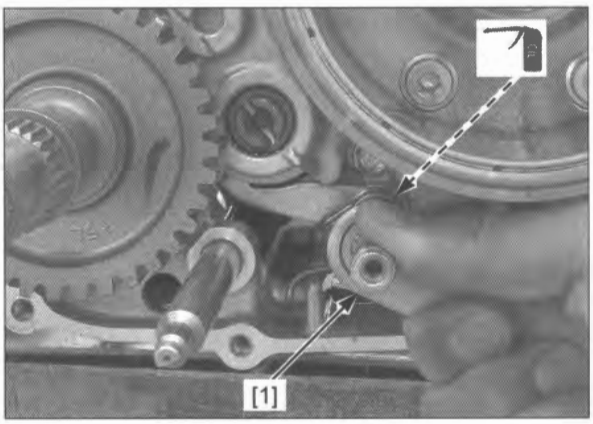
Check the return spring [2] for fatigue or damage.



INSTALLATION

Apply engine oil to the reverse stopper shaft journal surface.
Install the reverse stopper shaft assembly [1] into the crankcase as shown.

Install the rear crankcase cover (page 15-14).



MEMO

14. SUB-TRANSMISSION (FA models)

SERVICE INFORMATION 14-2

SYSTEM COMPONENTS 14-3

SUB-TRANSMISSION 14-4

RANGE SELECT LEVER LINKAGE 14-14

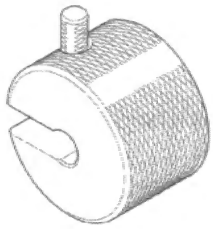
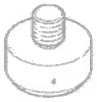
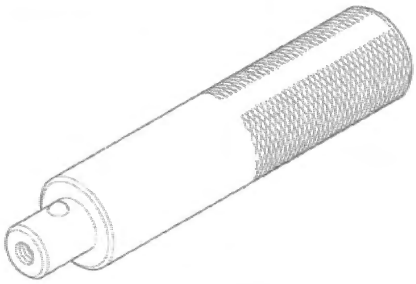
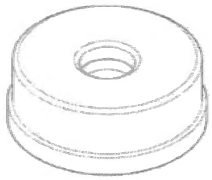
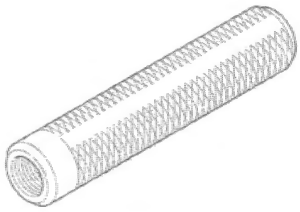
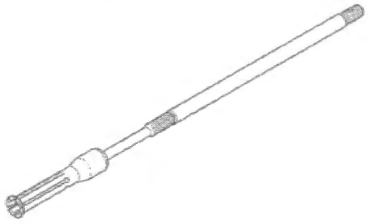
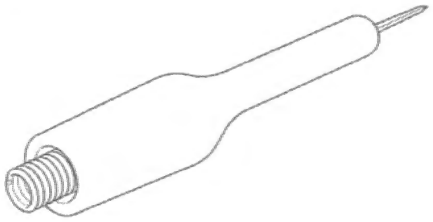
SUB-TRANSMISSION SWITCH 14-15

SERVICE INFORMATION

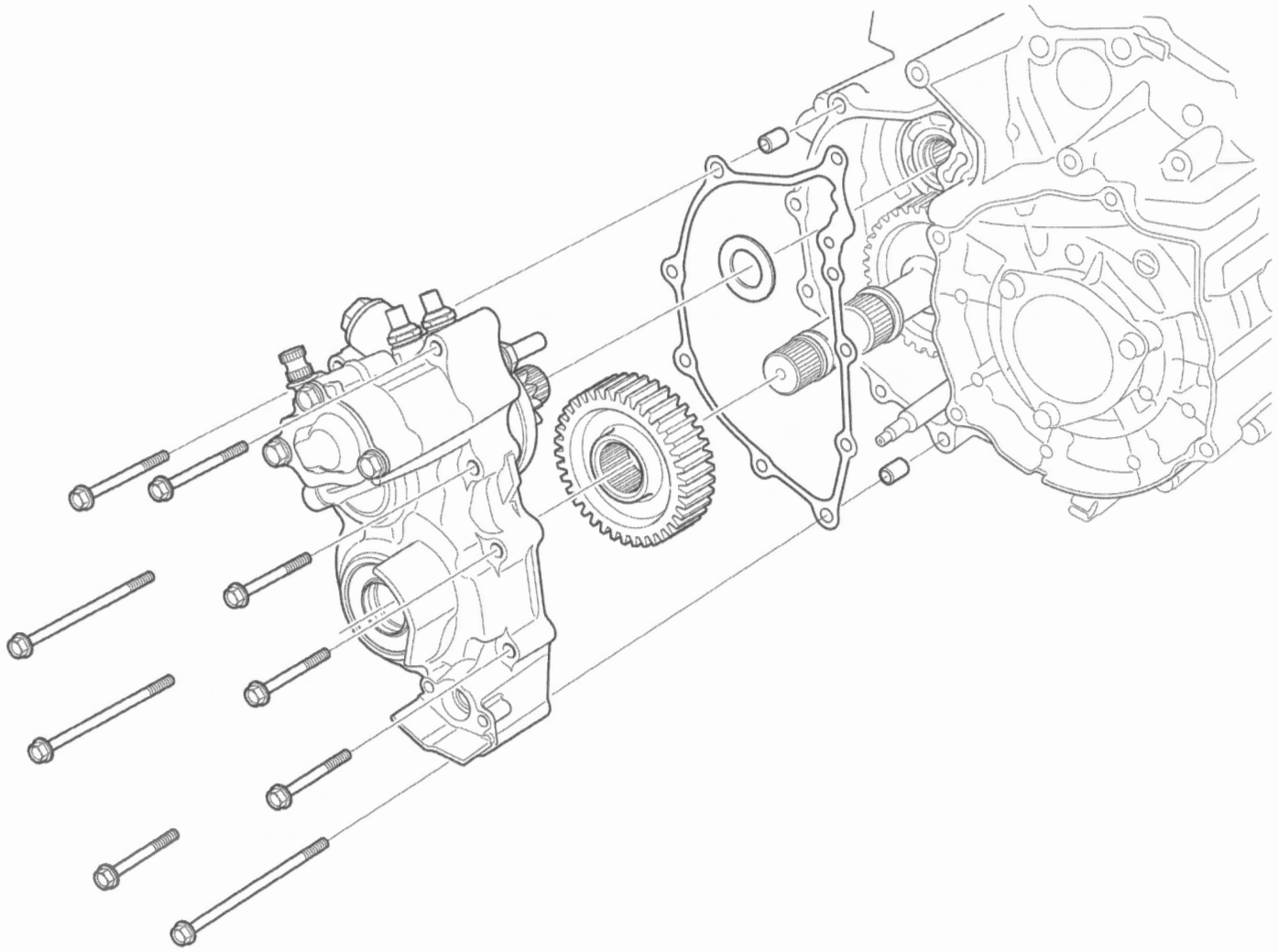
GENERAL

- This section covers service of the sub-transmission. These parts can be serviced with the engine installed in the frame.
- Be careful not to damage the crankcase and cover mating surfaces when servicing.

TOOLS

Remover Weight 07741-0010201  or 07936-371020A (U.S.A. only)	Attachment, 37 x 40 mm 07746-0010200 	Pilot, 17 mm 07746-0040400 
Pilot, 25 mm 07746-0040600 	Driver 07749-0010000 	Attachment, 52 x 55 mm 07746-0010400 
Remover handle 07936-3710100 	Bearing remover, 17 mm 07936-3710300 	Pin Probe Male (2 pack) 07ZAJ-RDJA110 

SYSTEM COMPONENTS



SUB-TRANSMISSION

REMOVAL

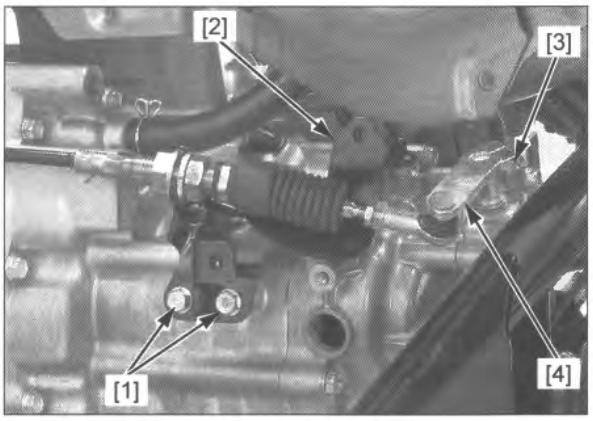
Remove the following:

- center mudguards (page 2-5)
- skid plate (page 2-16)
- rear wheels (page 19-6)
- rear VS sensor (page 13-65)
- shift spindle angle sensor (page 13-57)
- air cleaner housing (page 7-18)
- range select cable cover (page 3-22)

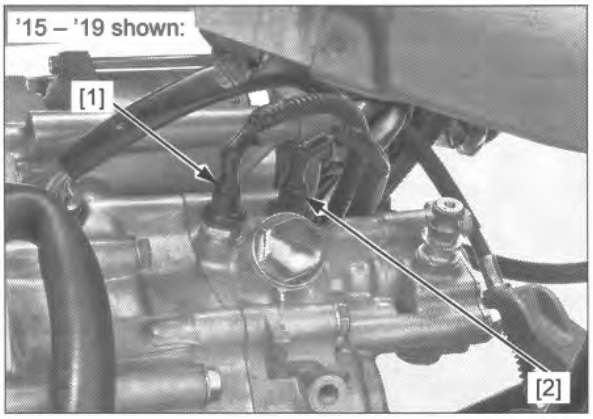
Put the range select lever in D position.

Remove the bolts [1] and range select cable bracket [2].

Remove the pinch bolt [3] and release the shift arm [4].



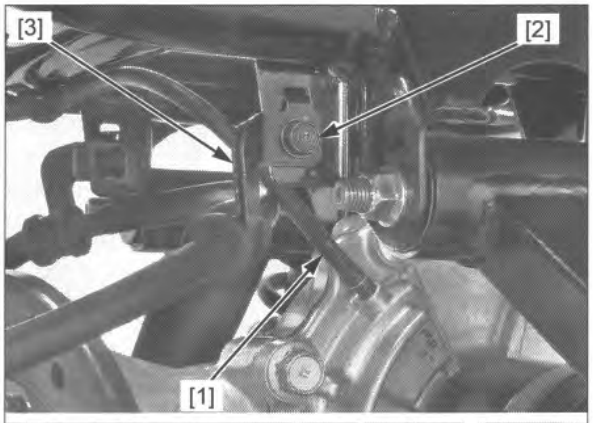
Disconnect the sub-transmission drive [1] and low [2] switch terminals.

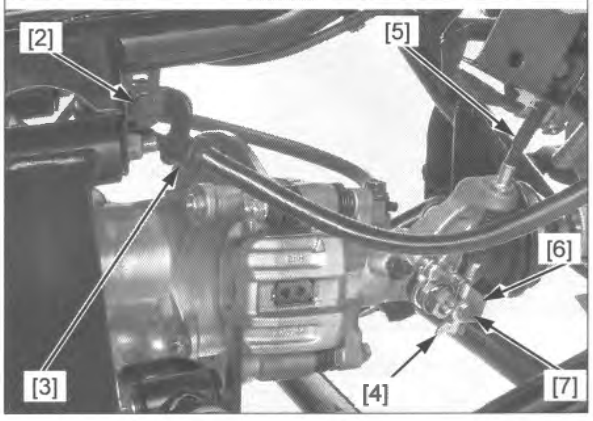


Disconnect the rear final gear case breather hose [1].

Remove the bolts [2] and rear brake hose clamps [3].

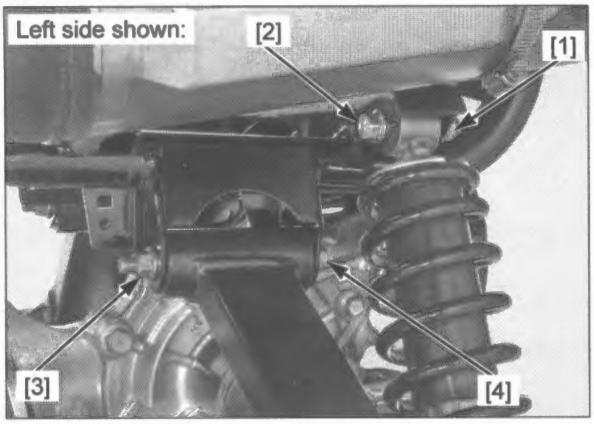
Remove the brake adjusting nut [4]. Disconnect the brake cable [5] from the brake arm [6] and remove the joint pin [7].
Remove the brake cable from the caliper body.



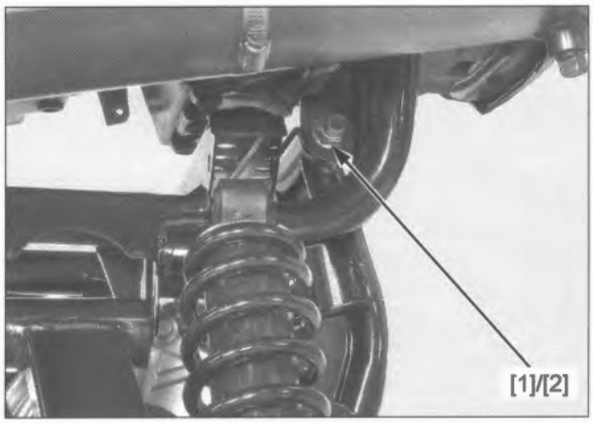


Remove the rear shock absorber upper mounting nuts [1] and bolts [2].

Remove the frame side upper arm pivot nuts [3] and bolts [4].

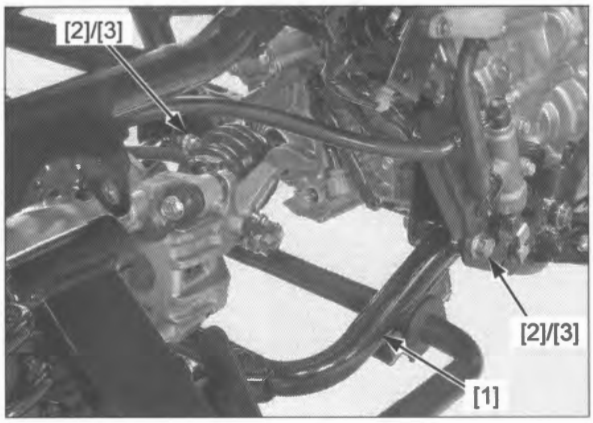


Loosen the rear sub-frame mounting pivot nut [1] while holding the bolt [2].



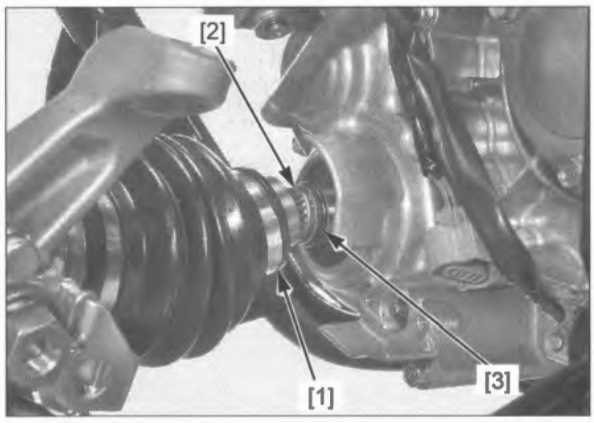
Support the rear sub-frame [1] with a jack or an adjustable support.

Remove the rear sub-frame mounting nuts [2] and bolts [3].



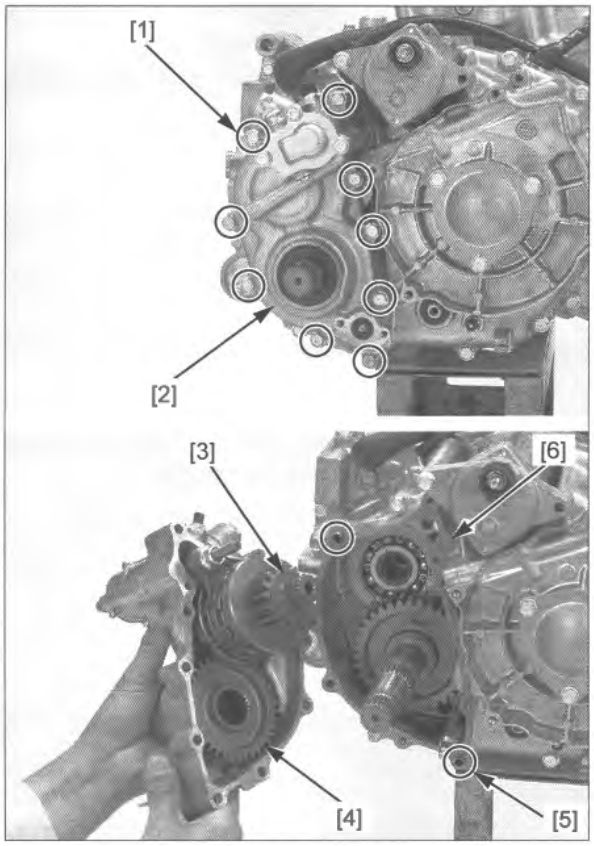
Slightly lower the rear sub-frame, then disconnect the universal joint [1] from the engine output shaft [2] while adjusting the sub-frame height.

Remove the O-ring [3] from the engine output shaft.



Remove the bolts [1] and sub-transmission case [2] with the thrust washer [3] and sub-transmission driven high gear [4].

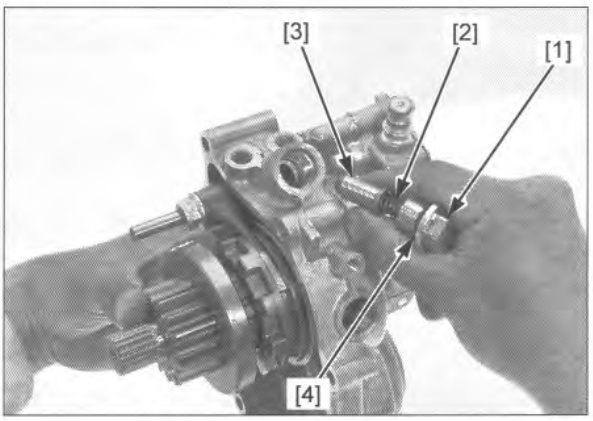
Remove the dowel pins [5] and gasket [6] from the rear crankcase cover.



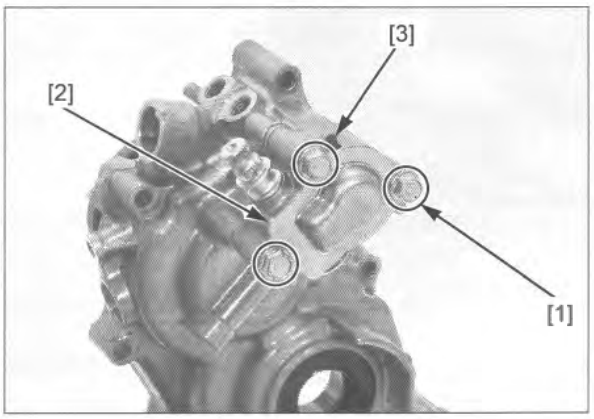
DISASSEMBLY

Remove the following:

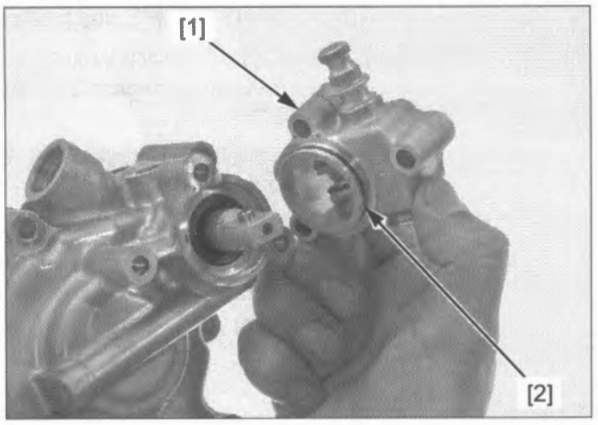
- setting cap [1]
- stopper spring [2]
- stopper pin [3]
- O-ring [4]



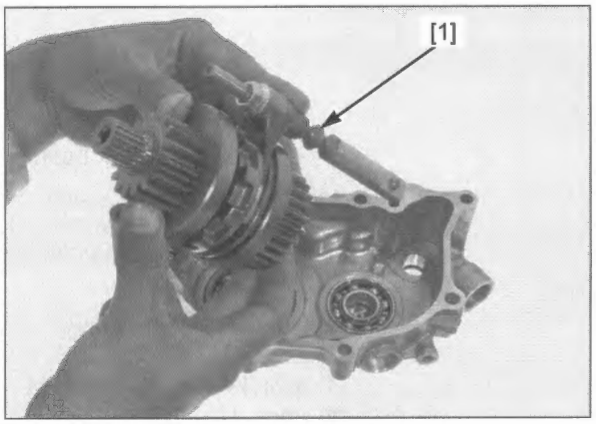
- bolts [1]
- cover plate [2]
- gasket [3]



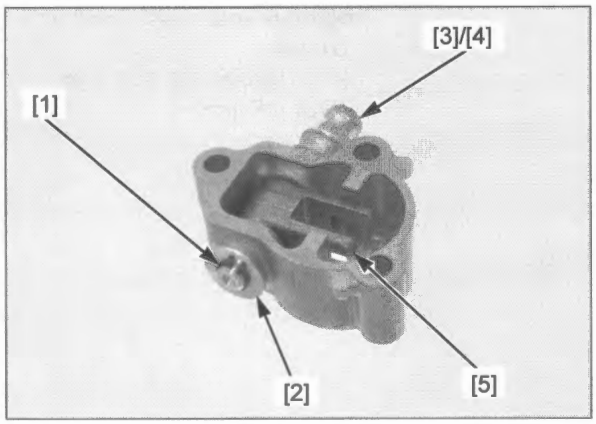
– change spindle housing [1]
– O-ring [2]



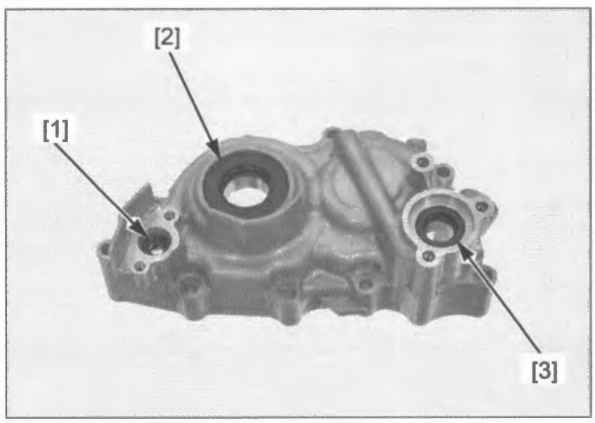
– sub-transmission assembly [1]



– snap ring [1]
– washer [2]
– change spindle [3] and O-rings [4]
– change lever pivot [5]



– shift spindle oil seal [1]
– engine output shaft oil seal [2]
– sub-transmission fork shaft oil seal [3]



BEARING REPLACEMENT

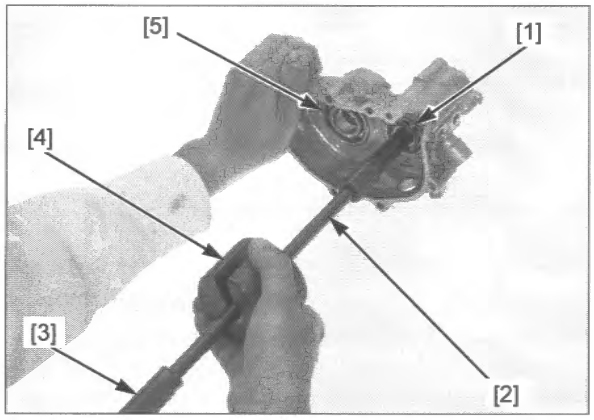
Refer to Crankcase/Transmission/Crankshaft/Balancer section for rear crankcase bearings replacement (page 16-19).

Remove the sub-transmission bearing [1] using the special tools.

TOOLS:

[2] Bearing remover, 17 mm	**07936-3710300**
[3] Remover handle	**07936-3710100**
[4] Remover weight	**07741-0010201 or 07936-371020A (U.S.A. only)**

Drive out the engine output shaft bearing [5].

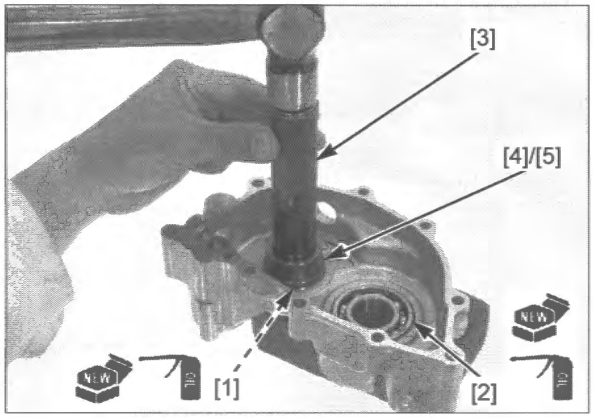


Apply engine oil to a new bearing cavity.

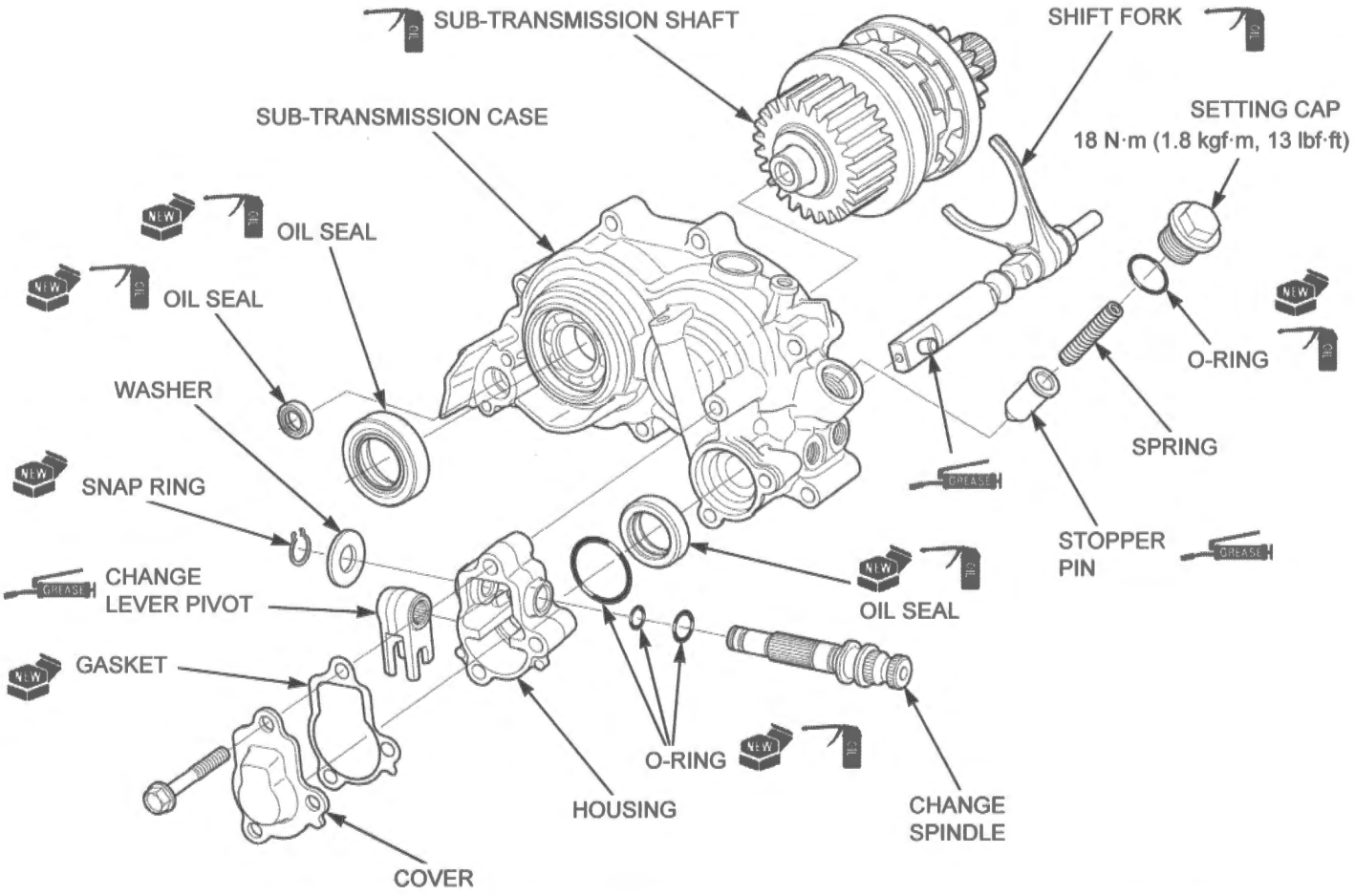
Install new sub-transmission bearing [1] and engine output shaft bearing [2] with marked side facing up until they are fully seated using the special tools.

TOOLS:

Sub-transmission bearing:	
[3] Driver	**07749-0010000**
[4] Attachment, 37 x 40 mm	**07746-0010200**
[5] Pilot, 17 mm	**07746-0040400**
Engine output shaft bearing:	
Driver	**07749-0010000**
Attachment, 52 x 55 mm	**07746-0010400**
Pilot, 25 mm	**07746-0040600**



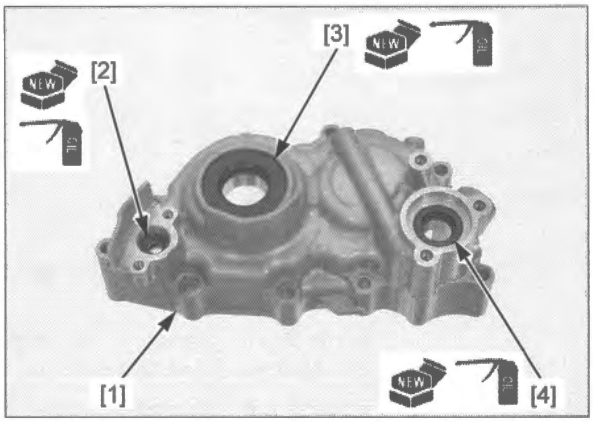
ASSEMBLY



Clean the sub-transmission case [1] and rear crankcase cover mating surfaces.

Apply engine oil to the lips of new oil seals, and install the following seals into the crankcase cover until they are fully seated.

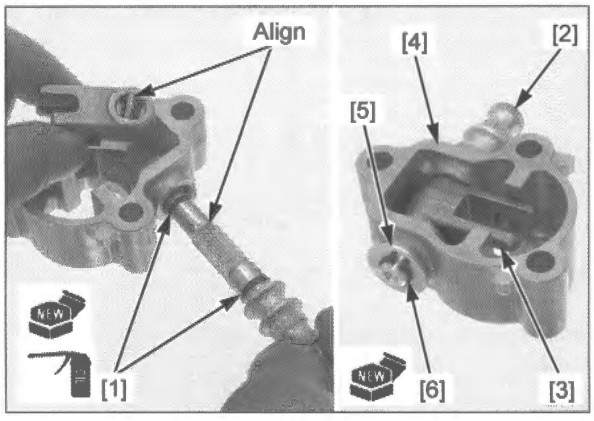
- shift spindle oil seal [2]
- engine output shaft oil seal [3]
- sub-transmission fork shaft oil seal [4]



Apply engine oil to new O-rings [1] and install them into the grooves of the change spindle [2].

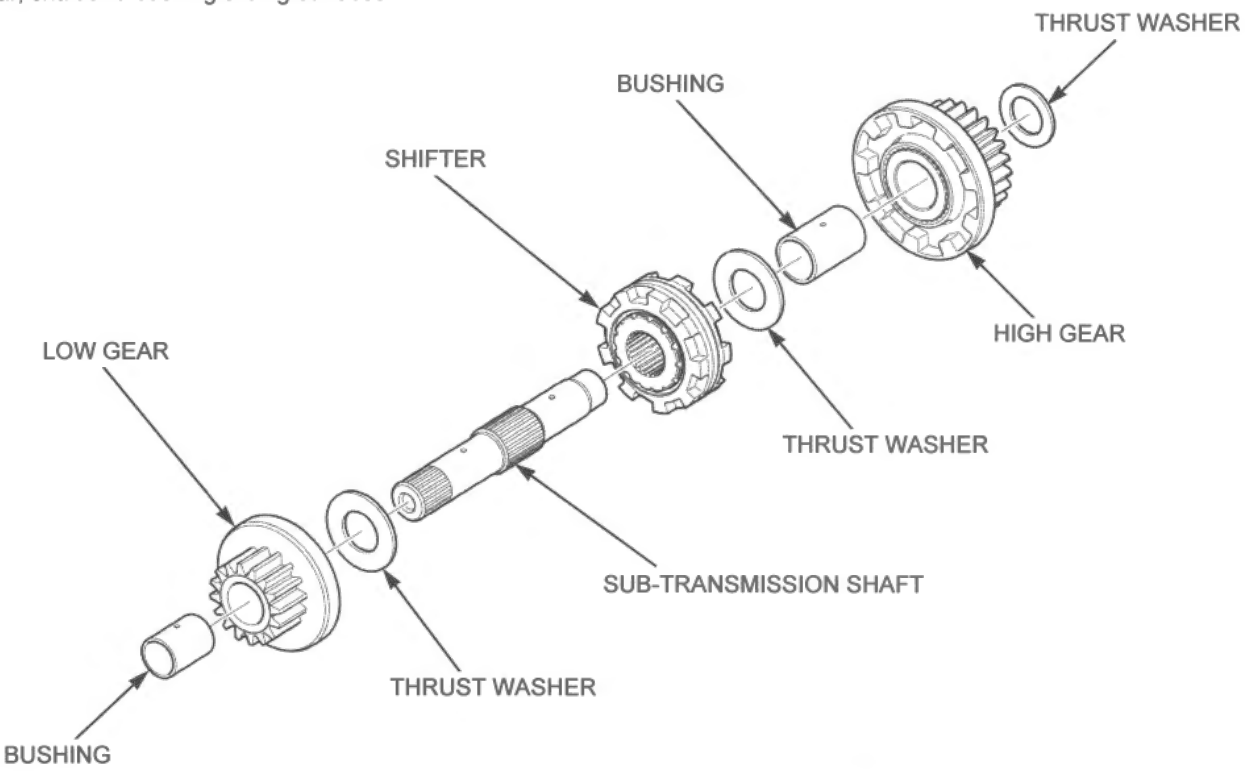
Install the change lever pivot [3] into the change spindle housing [4] in the direction as shown, then insert the change spindle into the housing and pivot while aligning its wide tooth with the wide groove in the lever pivot.

Install the washer [5] and a new snap ring [6].

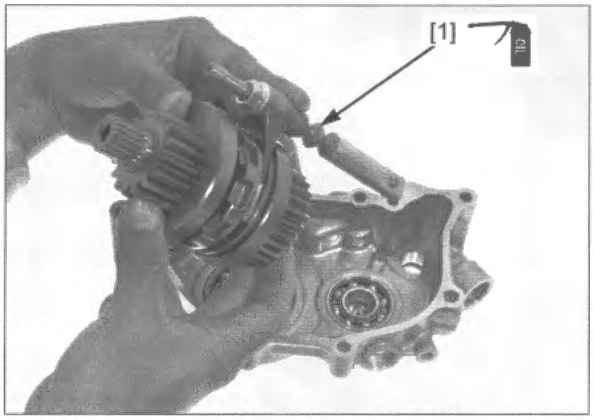


Assemble the sub-transmission shaft.

: Gear, shaft and bushing sliding surfaces



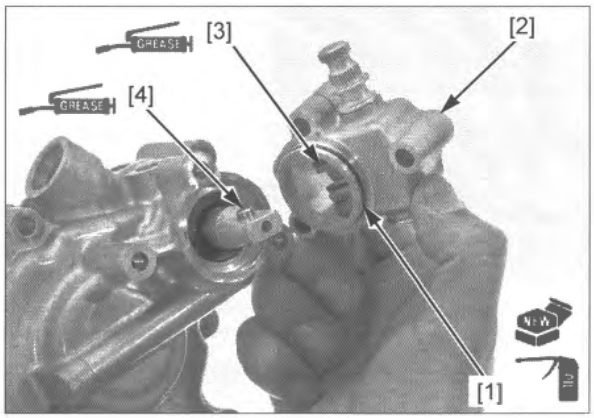
Apply engine oil to the shift fork [1] sliding surface and set the fork into the sub-transmission shifter groove, then install it into the case.



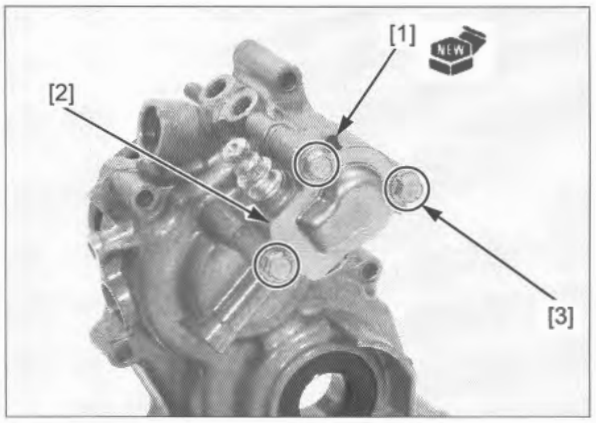
Install a new O-ring [1] the groove of change spindle housing assembly [2].

Apply lithium grease to the change lever pivot [3] and fork shaft pin [4] sliding surface.

Install the housing assembly while aligning the hook of the change lever pivot and fork shaft pin.



Install a new gasket [1].
Install the cover plate [2] and tighten the bolts [3].



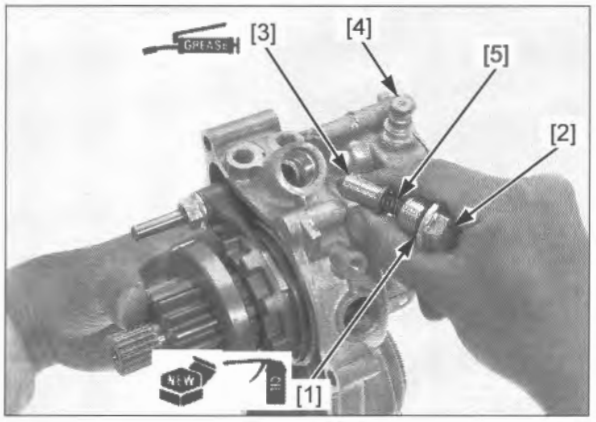
Apply engine oil to a new O-ring [1] and install it into the groove of the setting cap [2].

Apply lithium grease to the stopper pin [3] sliding surface.

Turn the change spindle [4] clockwise fully (Drive position), then install the stopper pin, spring [5] and setting cap.

Tighten the setting cap to the specified torque.

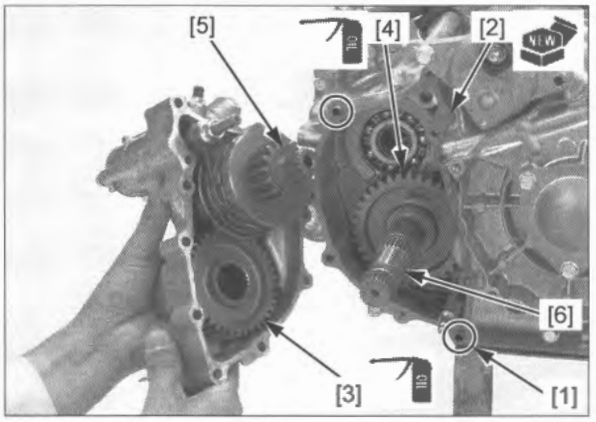
TORQUE: 18 N·m (1.8 kgf·m, 13 lbf·ft)



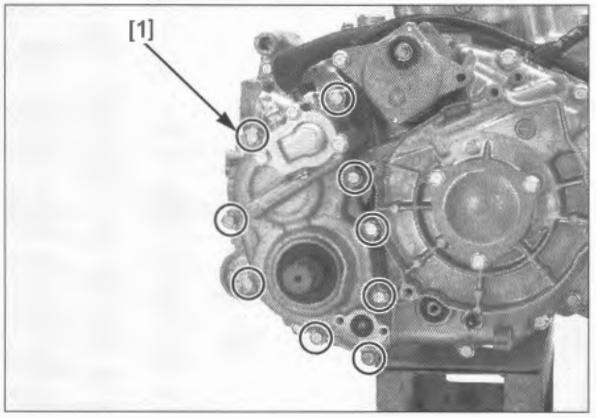
INSTALLATION

Install the two dowel pins [1] and a new gasket [2].

Apply engine oil to sub-transmission driven high gear [3] and low gear [4] teeth, then set the high gear into the case as shown.
Install the thrust washer [5] to the shaft end, then install the sub-transmission assembly while turning the engine output shaft [6] to align the gear teeth and splines.

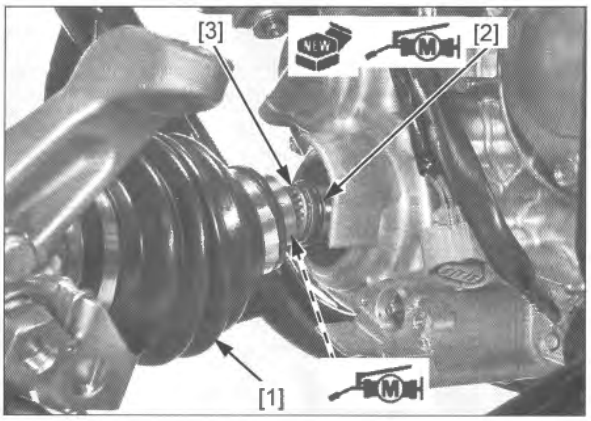


Install and tighten the bolts [1] in a crisscross pattern in several steps.



Apply molybdenum disulfide grease to inner splines of universal joint [1] and a new O-ring [2], then install it to the engine output shaft [3].

Connect the universal joint to the engine output shaft while lifting up the front side of rear sub-frame.



Install the bolts from the outboard side.

Install the rear sub-frame mounting bolts [1] and new nuts [2].

'15 – '19:

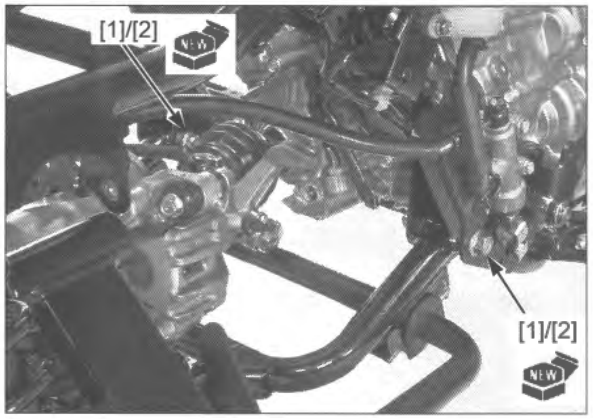
Tighten nuts to the specified torque.

TORQUE: 130 N·m (13.3 kgf·m, 96 lbf·ft)

After '19:

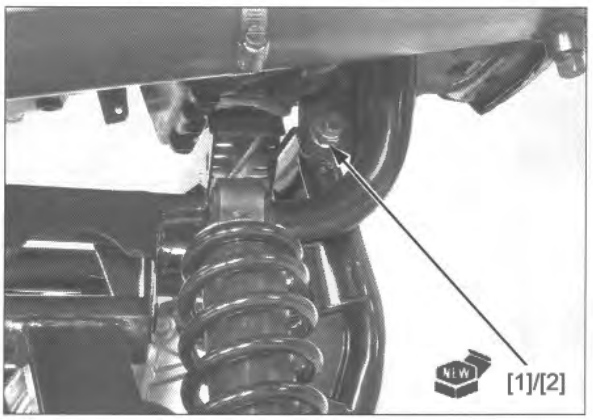
Tighten bolts to the specified torque.

TORQUE: 120 N·m (12.2 kgf·m, 89 lbf·ft)



Remove the rear sub-frame mounting pivot nut [1] and replace it with a new one, then install and tighten it to the specified torque while holding the bolt [2].

TORQUE:
'15 – '19: 130 N·m (13.3 kgf·m, 96 lbf·ft)
After '19: 75 N·m (7.6 kgf·m, 55 lbf·ft)



Install the upper arm pivot bolts from the rear side.

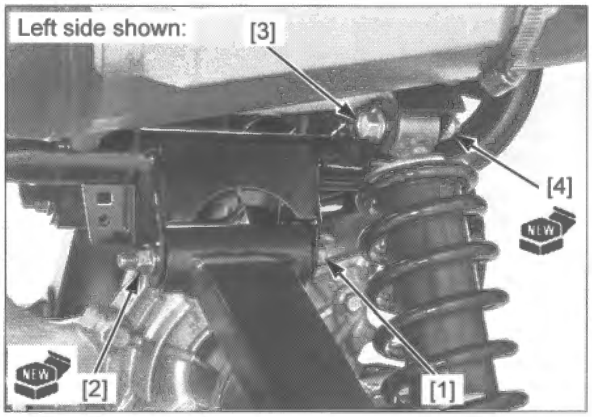
Install the frame side upper arm pivot bolts [1] and new nuts [2] and loosely tighten them.

- Tighten the pivot nuts to the specified torque after placing the vehicle on level ground.

Install the upper mounting bolts from the front side.

Install the rear shock absorber upper mounting bolts [3] and new nuts [4] and tighten them to the specified torque.

TORQUE: 44 N·m (4.5 kgf·m, 32 lbf·ft)

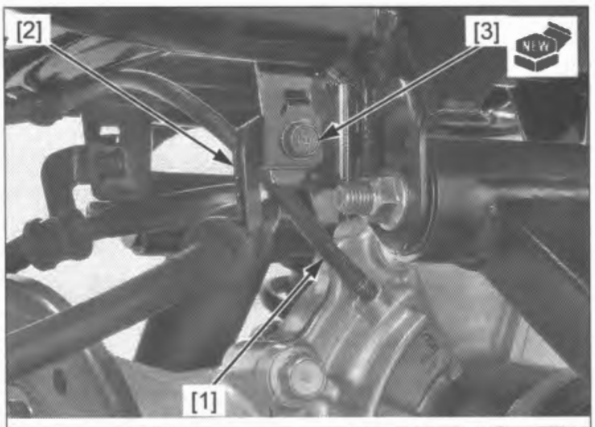


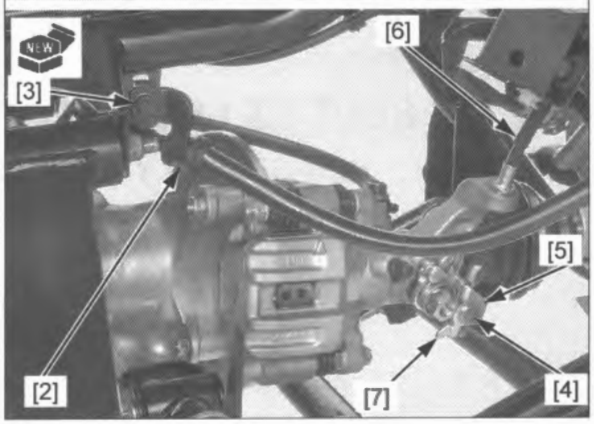
Connect the rear final gear case breather hose [1].

Set the rear brake hose clamps [2] to the frame, then install and tighten new bolts [3].

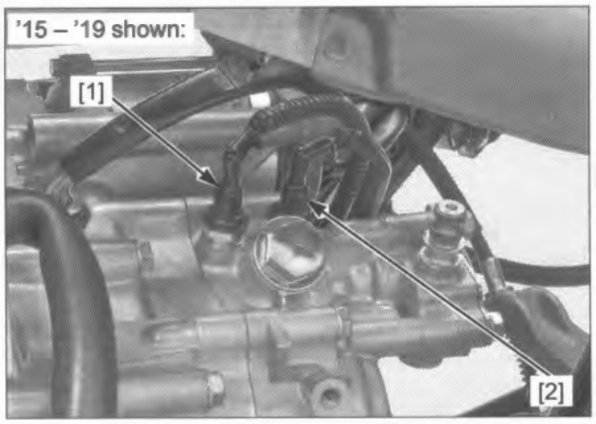
Install the joint pin [4] into the brake arm [5], then install the brake cable [6] into the brake caliper and joint pin. Install the adjusting nut [7].

Adjust the parking brake cable (page 3-27).



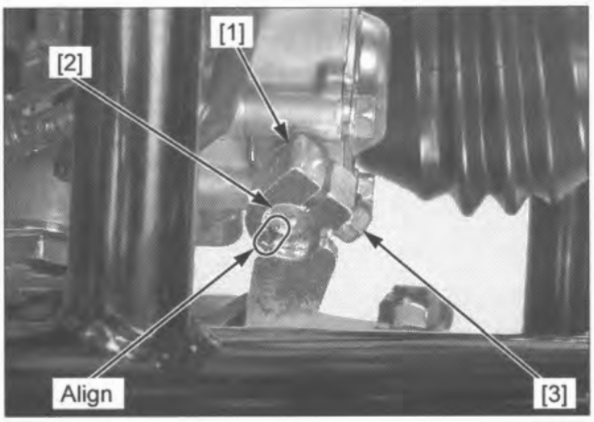


Connect the sub-transmission drive [1] (with a corrugated tube) and low [2] switch terminals.



Install the shift arm [1] to the change spindle [2] while aligning its slit with the punch mark on the spindle. Install and tighten the pinch bolt [3] to the specified torque.

TORQUE: 16 N·m (1.6 kgf·m, 12 lbf·ft)



Set the range select cable bracket [1] in position, then install and tighten the bolts [2].

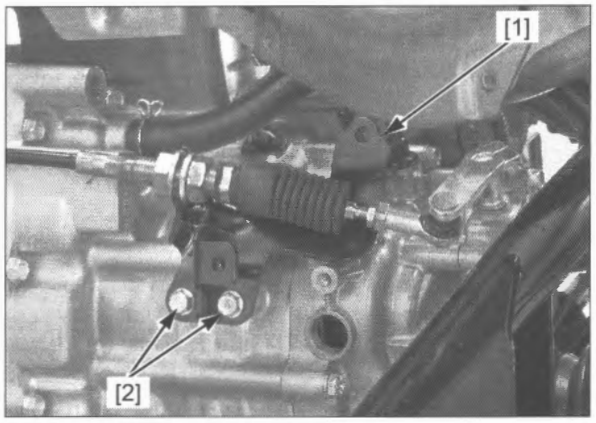
Check the range select operation (page 3-22).

Install the following:

- air cleaner housing (page 7-18)
- shift spindle angle sensor (page 13-57)
- rear VS sensor (page 13-65)
- range select cable cover (page 3-22)
- rear wheels (page 19-6)
- skid plate (page 2-16)
- center mudguards (page 2-5)

Place the vehicle on level ground. Tighten the rear upper arm pivot nuts to the specified torque.

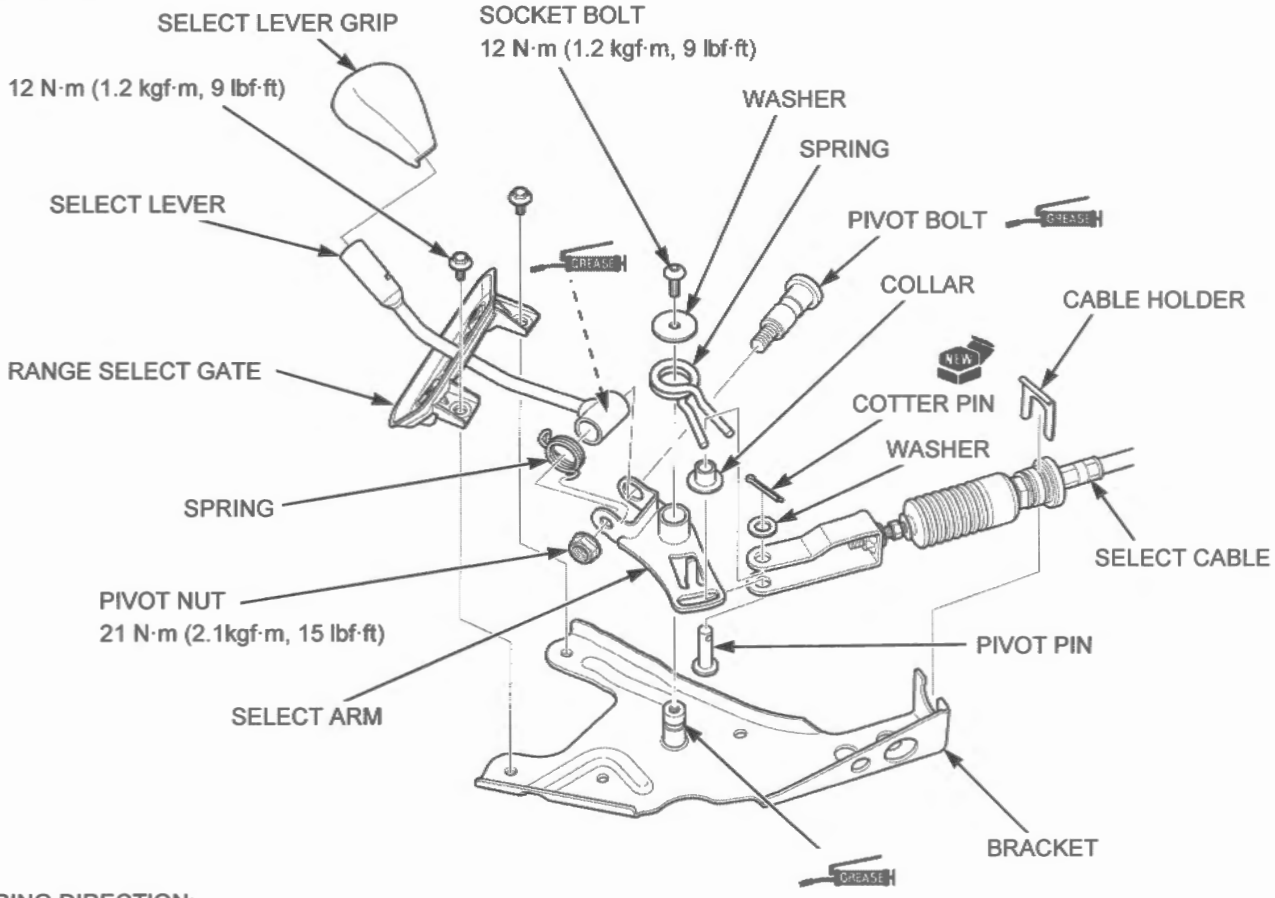
TORQUE: 44 N·m (4.5 kgf·m, 32 lbf·ft)



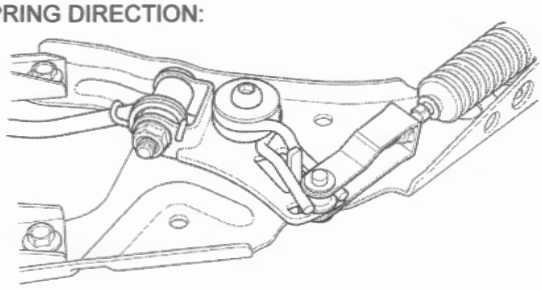
RANGE SELECT LEVER LINKAGE

DISASSEMBLY/ASSEMBLY

'14 – '21 shown:



SPRING DIRECTION:



SUB-TRANSMISSION SWITCH

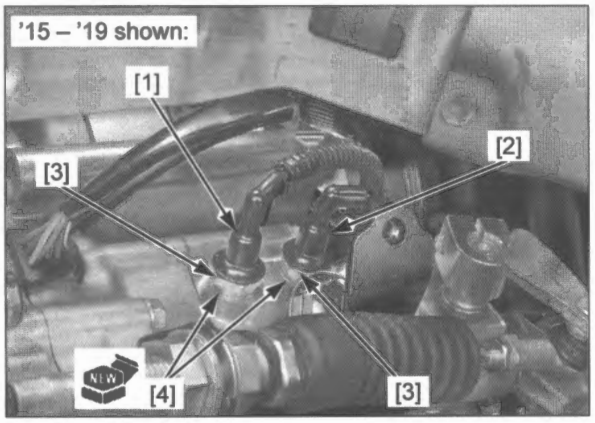
REMOVAL/INSTALLATION

Remove the range select cable cover (page 3-22).

Disconnect the sub-transmission drive [1] (with a corrugated tube) and low [2] switch terminals.

Remove the sub-transmission switches [3] and sealing washers [4].

Installation is in the reverse order of removal.



SYSTEM INSPECTION

1. **Sub-transmission Low Switch Inspection at PCM Connector**

   Turn the ignition switch OFF.
   Disconnect the PCM 33P (Gray) connector [1] (page 4-45).
   Check for continuity between the wire harness side 33P connector terminal and ground.

   TOOL:
   Pin Probe Male (2 pack) **07ZAJ-RDJA110**

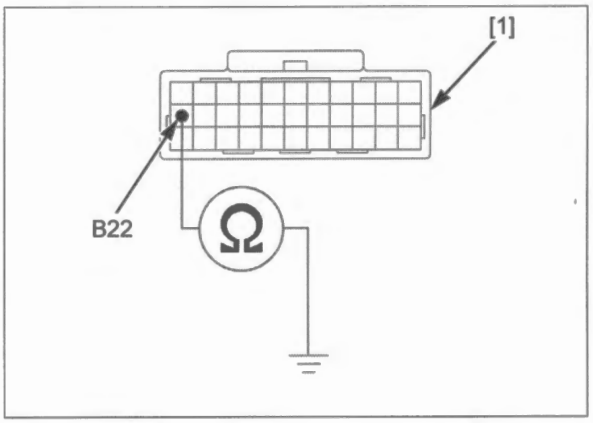
   Connection: B22 – ground

   There should be continuity with the range select lever in Low position and no continuity with the lever in Drive position.

   Are the test results normal?

   YES – GO TO STEP 2.

   NO – GO TO STEP 3.



2. **Sub-transmission Drive Switch Inspection at PCM Connector**

   Disconnect the PCM 33P (Black) connector [1] (page 4-45).
   Check for continuity between the wire harness side 33P connector terminal and ground.

   TOOL:
   Pin Probe Male (2 pack) **07ZAJ-RDJA110**

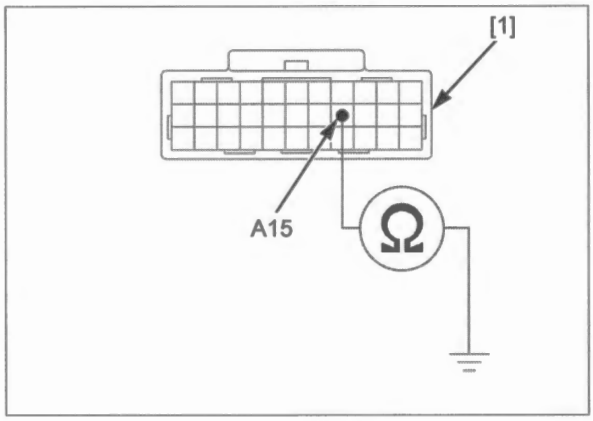
   Connection: A15 – ground

   There should be continuity with the range select lever in Drive position and no continuity with the lever in Low position.

   Are the test results normal?

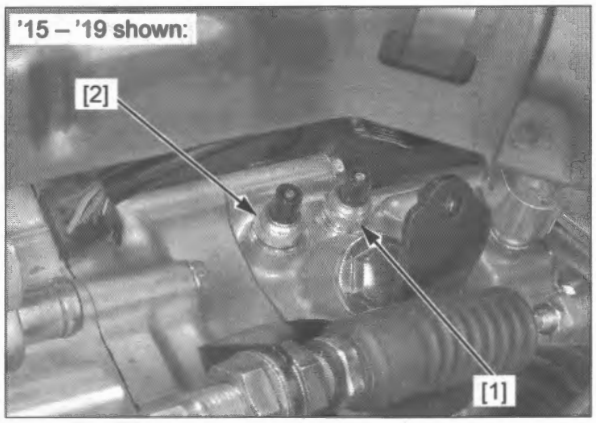
   YES – The system is normal.

   NO – GO TO STEP 3.



3. Sub-transmission Switch Inspection at Switch

Disconnect the sub-transmission low and drive switch terminals (page 14-15).
Check for continuity between the switch terminal and ground in each range select lever position.
There should be continuity between the Low switch [1] terminal and ground when the lever is in Low position and no continuity with the lever in Drive position.
There should be continuity between the Drive switch [2] terminal and ground when the lever is in Drive position and no continuity with the lever in Low position.



Are the test results normal?

YES – • Open or short circuit in the White wire
• Open or short circuit in the Black wire

NO – Faulty sub-transmission switch

15. ALTERNATOR/STARTER CLUTCH

SERVICE INFORMATION 15-2

TROUBLESHOOTING 15-3

SYSTEM COMPONENTS 15-4

RECOIL STARTER (CM/ III A types) 15-8

ALTERNATOR STATOR 15-8

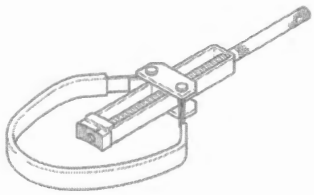
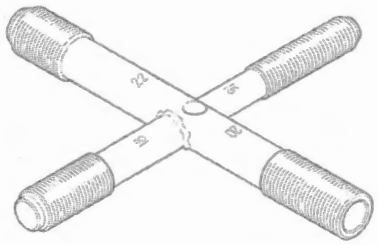
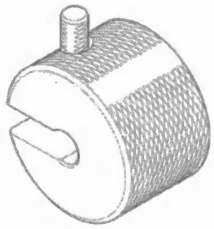
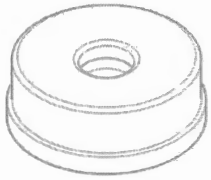
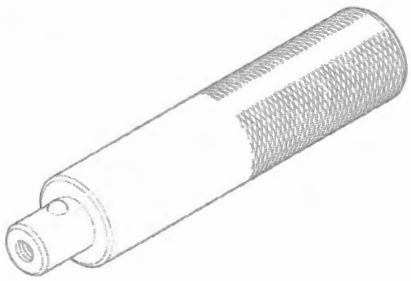
FLYWHEEL/STARTER CLUTCH 15-18

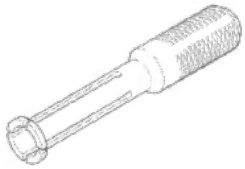
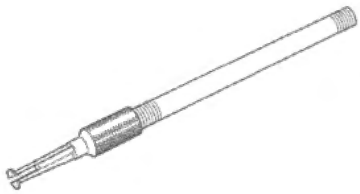
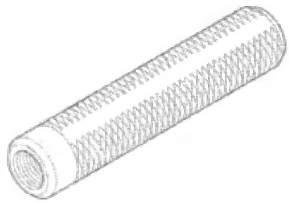
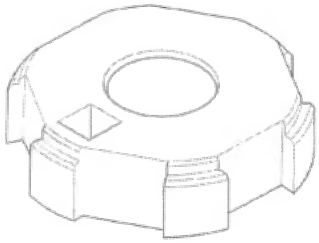
SERVICE INFORMATION

GENERAL

- This section covers service of the alternator stator, flywheel and starter clutch.
- Transmission lubricating oil is fed through the oil passages in the rear crankcase cover. Clean the oil passages before installing the cover.
- For alternator stator inspection, see Battery/Charging System section (page 23-7)
- For starter motor servicing, see Electric Starter section (page 6-7).
- For gear position switch servicing, see Lights/Meters/Switches section (page 24-17).

TOOLS

Holder Flywheel 07725-0040001  or equivalent commercially available in U.S.A.	Outside Screw Puller 07733-0020001  or 07933-3000001 (U.S.A. only)	Remover Weight 07741-0010201  or 07936-371020A (U.S.A. only)
Attachment, 52 x 55 mm 07746-0010400 	Attachment, 24 x 26 mm 07746-0010700 	Pilot, 10 mm 07746-0040100  Not available in U.S.A.
Pilot, 25 mm 07746-0040600 	Driver 07749-0010000 	Remover Shaft, 10 mm 07936-GE00100  Not available in U.S.A.

Remover Head, 10 mm 07936-GE00200  Not available in U.S.A.	Bearing remover, 10 mm 07936-GE0A000 (U.S.A. only) 	Remover handle 07936-3710100 
Recoil Pulley Holder 07SMB-HM70100 		

TROUBLESHOOTING

Starter motor turns, but engine does not turn

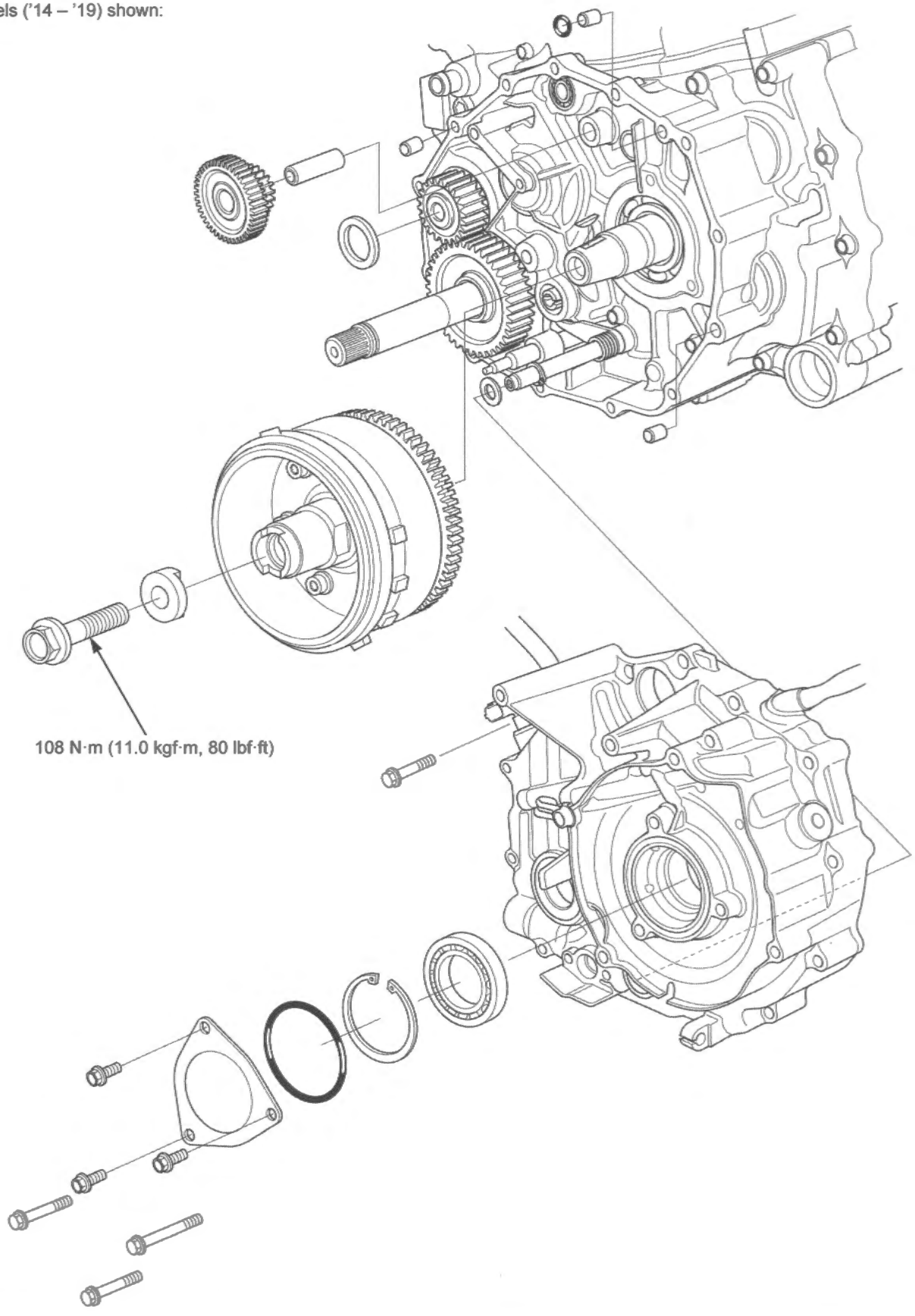
- Faulty starter clutch
- Damaged starter reduction gear and/or driven gear

SYSTEM COMPONENTS

FM/FE models:

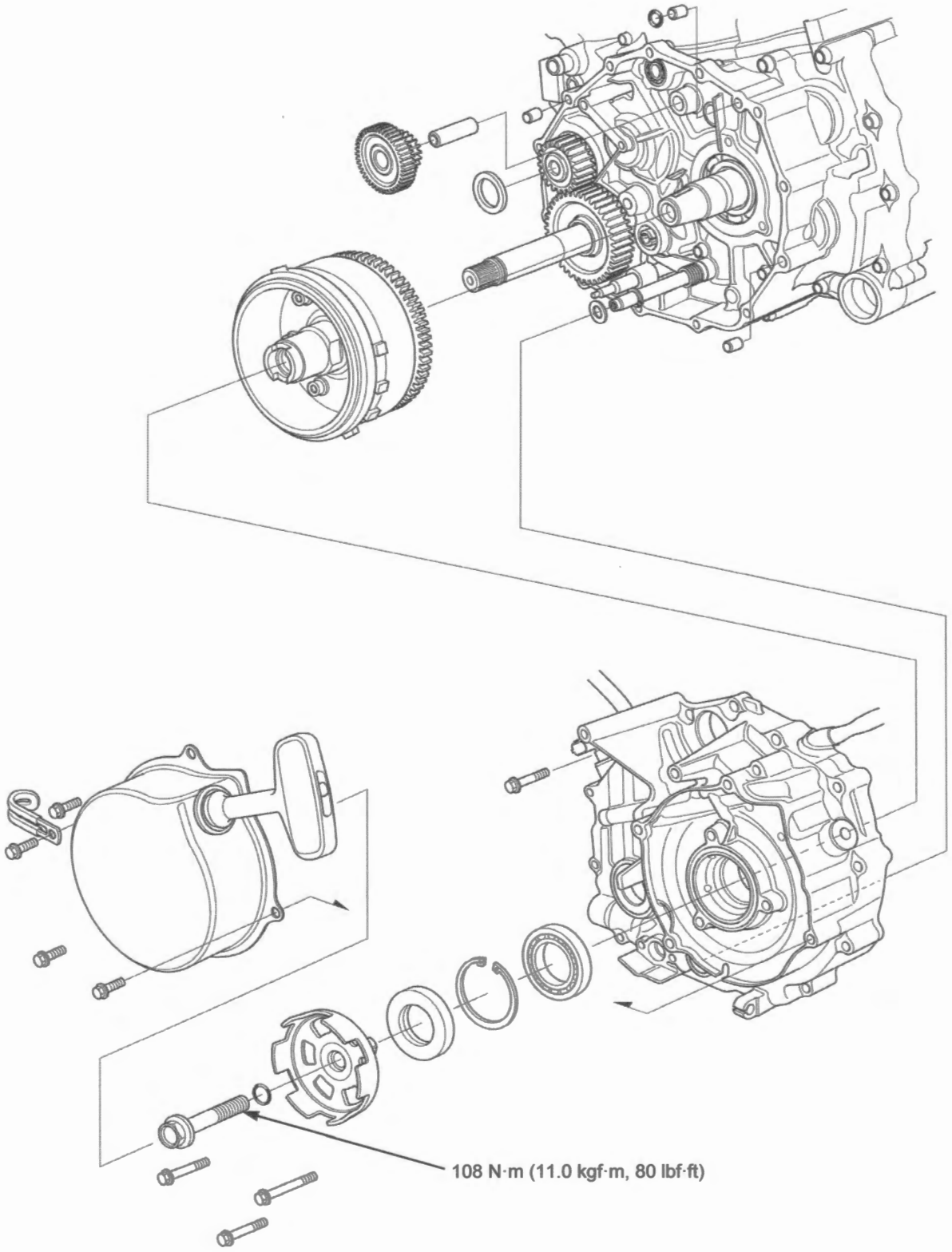
Except CM type:

FE models ('14 – '19) shown:



CM type:

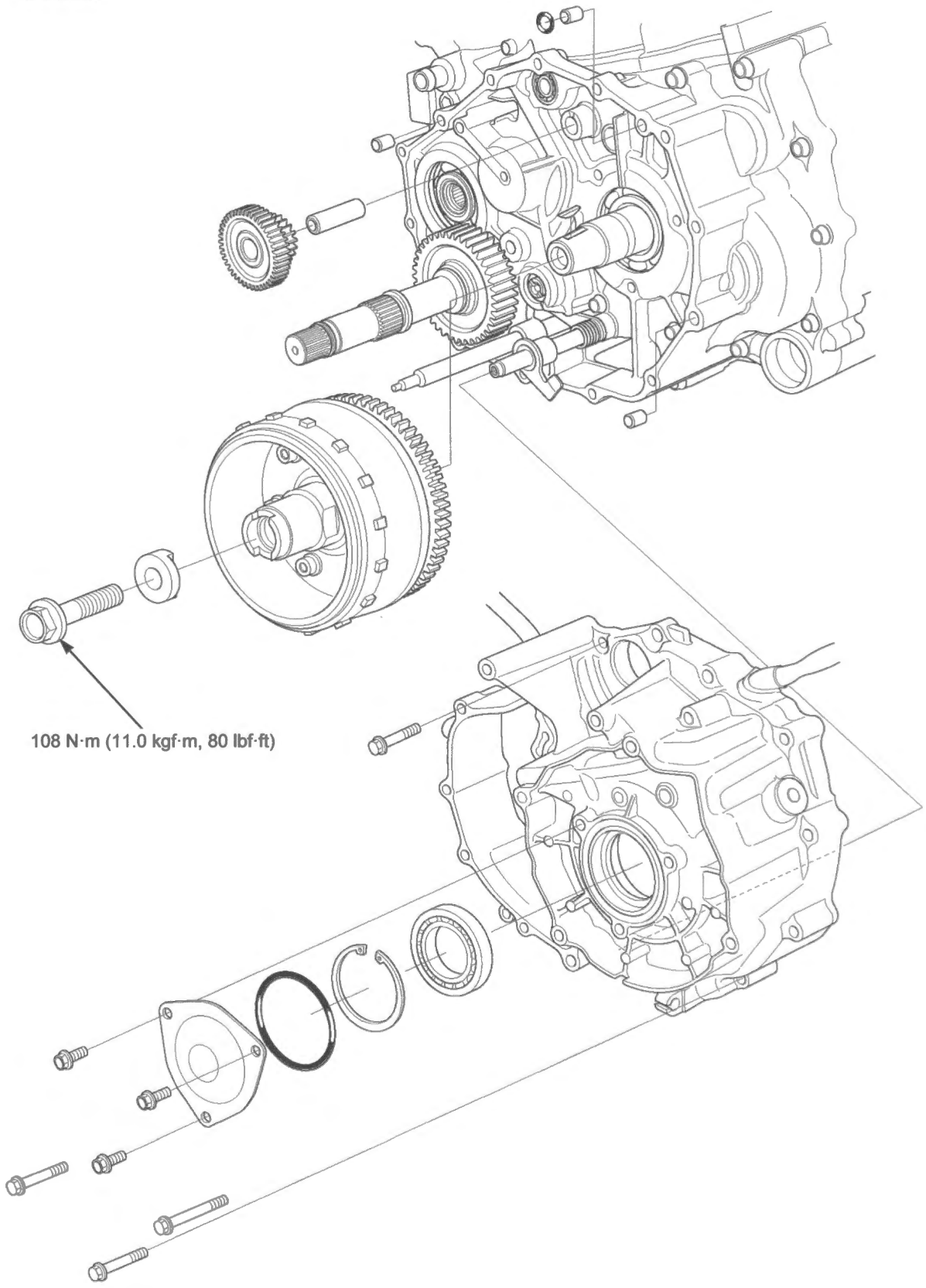
FE models ('14 – '19) shown:



FA models:

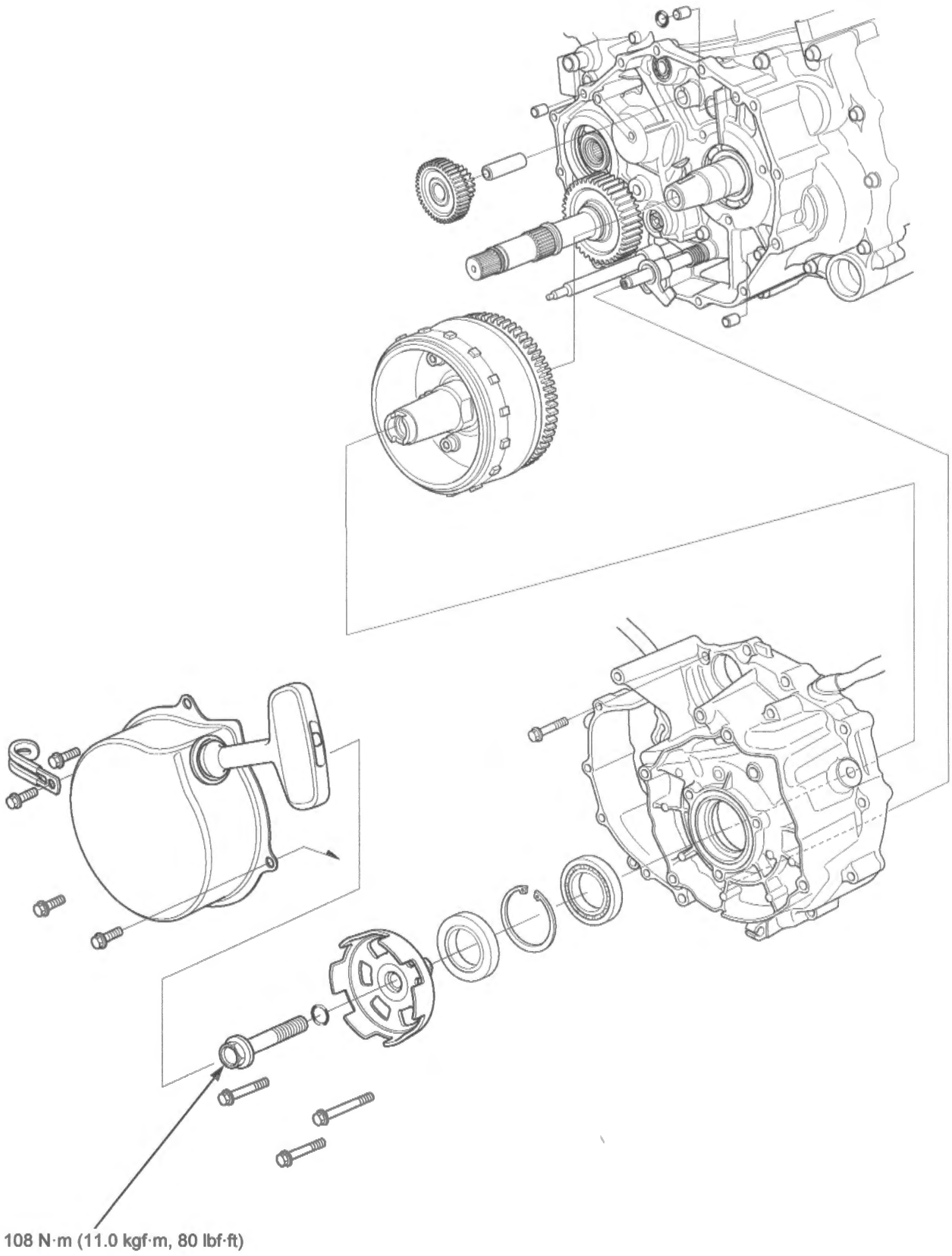
Except CM/ III A types:

'15 – '19 shown:



CM/ III A types:

'15 – '19 shown:



RECOIL STARTER (CM/ III A types)

REMOVAL/INSTALLATION

Remove the center mudguards (page 2-5).

Remove the following:

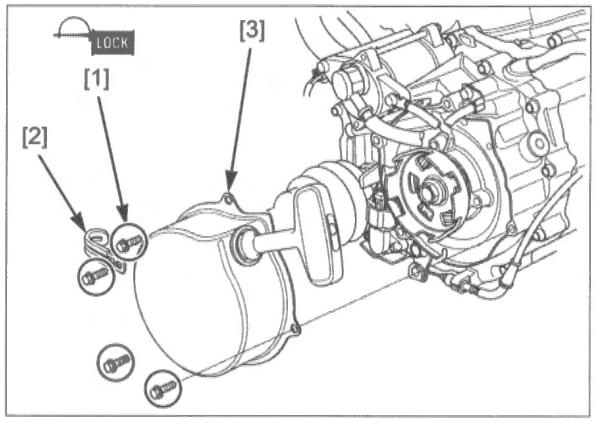
- four bolts [1] and clamp [2]
- recoil starter assembly [3]

Apply locking agent to the bolt threads.

Install the recoil starter assembly with the four bolts and clamp, and tighten the bolts in a crisscross pattern in several steps.

Secure the wire with the clamp properly.

Install the center mudguards (page 2-5).



STARTER ROPE REPLACEMENT

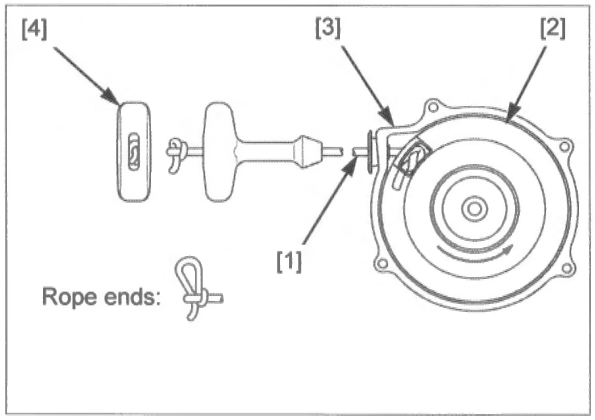
When the rope has broken or the pulley has rewound, align the rope holes by turning the pulley 6-1/2 turns counterclockwise and hold it

Pull the starter rope [1] fully to align the rope holes in the drive pulley [2] and housing [3], and secure the pulley with vise pliers or an equivalent tool to prevent the pulley from rewinding.

Untie the starter rope and remove the rope.

Insert a new starter rope through the pulley, housing and grip [4], and tie the rope ends in a square knot. Set the pulley side rope end into the cavity as shown.

Carefully release the pulley and check the recoil starter for smooth operation by pulling the grip.



ALTERNATOR STATOR

REAR CRANKCASE COVER REMOVAL

FM/FE models:

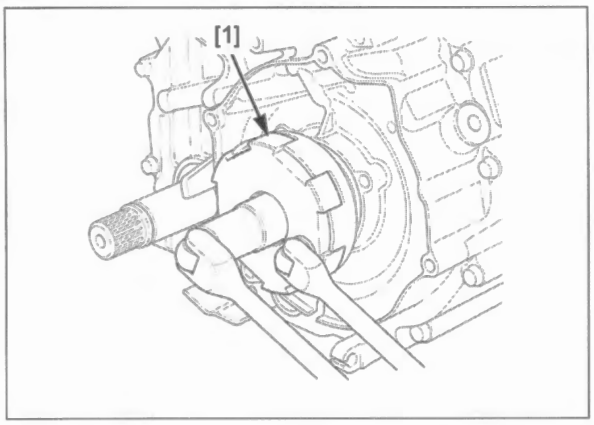
Remove the following:

- air cleaner housing (page 7-18)
- center mudguards (page 2-5)
- engine guard (page 2-8)
- FM1/FM2/FE1/FE2: swingarm (page 19-9)
- starter motor (page 6-7)
- CM/ III A types: recoil starter (page 15-8)
- FE models only: shift spindle angle sensor (page 25-30)
- FE2 models only: TR sensor (After '19) (page 25-32)
- FE2 models only: neutral switch (After '19) (page 25-33)

FM5/FM6/FM7: Disconnect the rear propeller shaft (page 14-4).

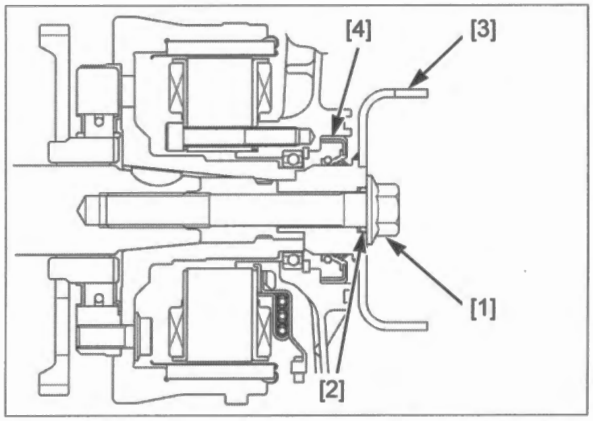
CM/ III A types: Hold the recoil starter driven pulley using the special tool and loosen the bolt.

TOOL:
[1] Recoil Pulley Holder 07SMB-HM70100



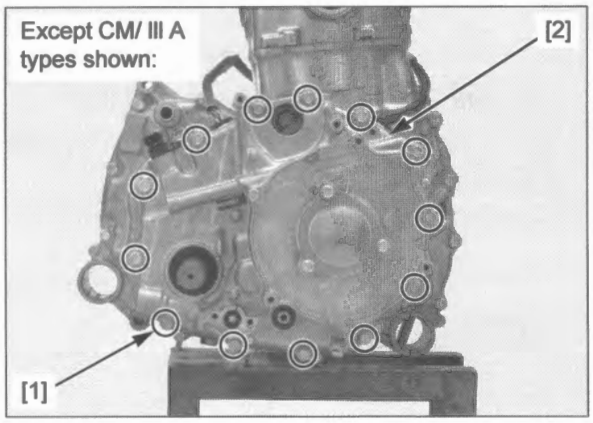
CM/ III A types: Remove the following:

- bolt [1] and O-ring [2]
- driven pulley [3]
- oil seal [4]

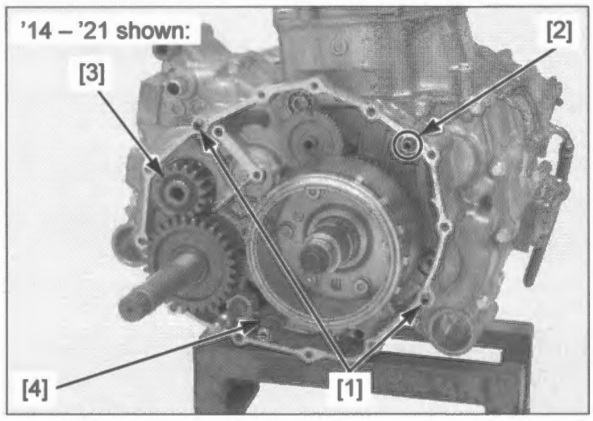


The cover (stator) is magnetically attracted to the flywheel, be careful during removal.

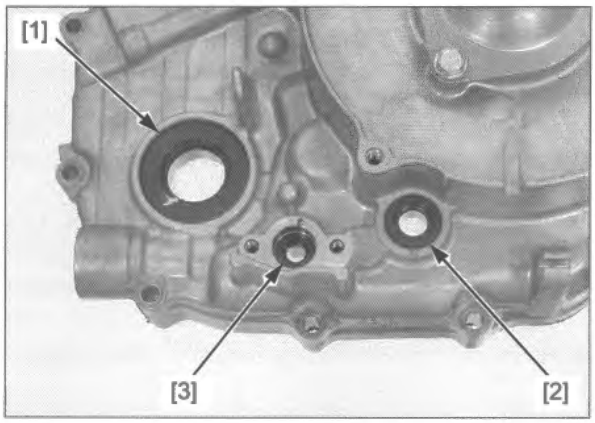
- thirteen bolts [1]
- rear crankcase cover [2]



- two dowel pins [1]
- oil joint pipe and O-ring [2]
- countershaft thrust washer [3]
- reverse stopper shaft thrust washer [4] (FM models (All)/FE models ('14 – '19))



- output shaft oil seal [1]
- reverse lock lever oil seal [2]
- FE models only: gearshift spindle oil seal [3]



FA models:

Remove the following:

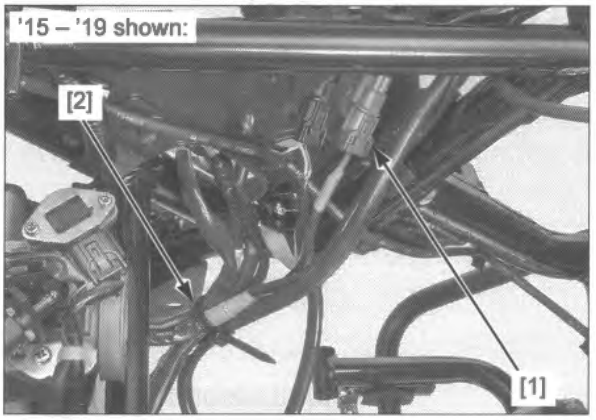
- center mudguards (page 2-5)
- starter motor (page 6-7)
- Canada type only: recoil starter (page 15-8)
- shift spindle angle sensor (page 13-57)
- TR sensor (After '19) (page 13-58)
- neutral switch (After '19) (page 13-58)
- sub-transmission (page 14-4)

'15 – '19: Disconnect the shift drum position switch 10P (Gray) connector [1].

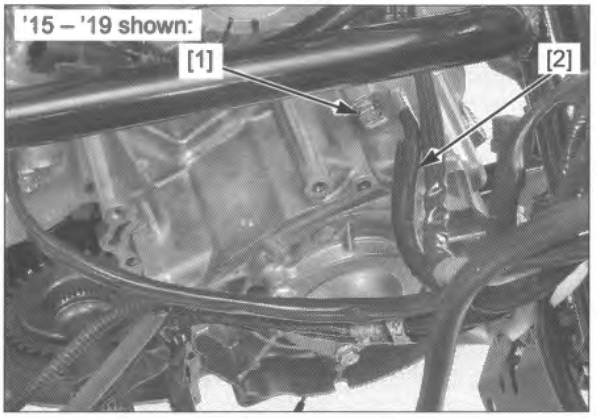


Disconnect the CKP sensor 2P (Gray) connector [1].

'15 – '19: Remove the wire band [2].



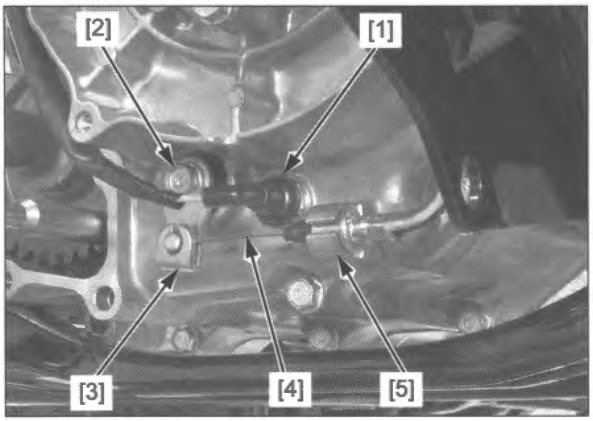
Remove the bolt [1] and battery (–) cable [2].



'15 – '19: Disconnect the reverse switch terminal [1] from the switch.

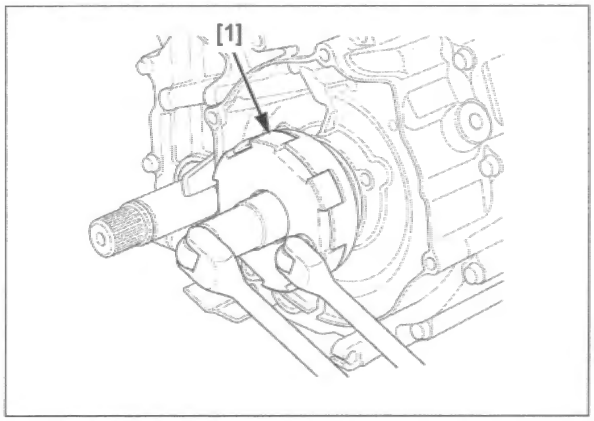
'15 – '19: Remove the following:

- bolt [2] and selector arm [3] (to disconnect the selector cable)
- selector cable [4] (from the cable holder [5] of the engine)



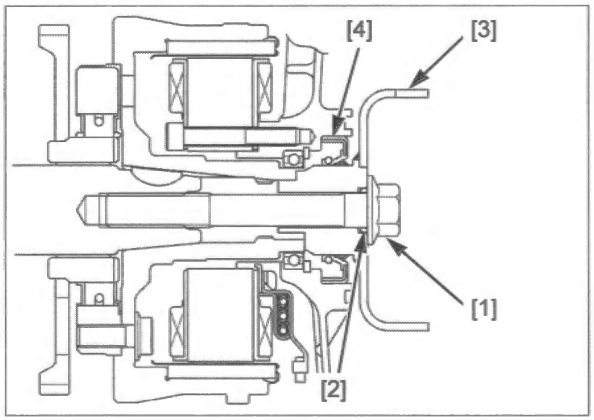
CM/ III A types: Hold the recoil starter driven pulley using the special tool and loosen the bolt.

TOOL:
[1] Recoil Pulley Holder 07SMB-HM70100



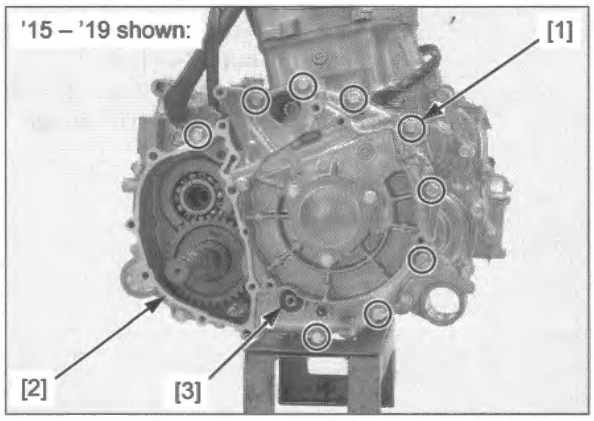
CM/ III A types: Remove the following:

- bolt [1] and O-ring [2]
- driven pulley [3]
- oil seal [4]

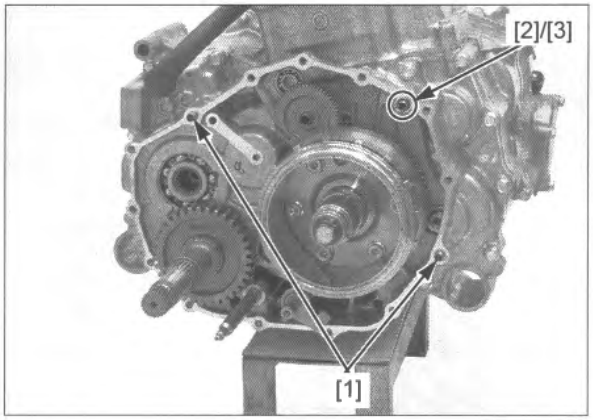


The cover (stator) is magnetically attracted to the flywheel, be careful during removal.

- nine bolts [1]
- rear crankcase cover [2]
- reverse lock lever oil seal [3]



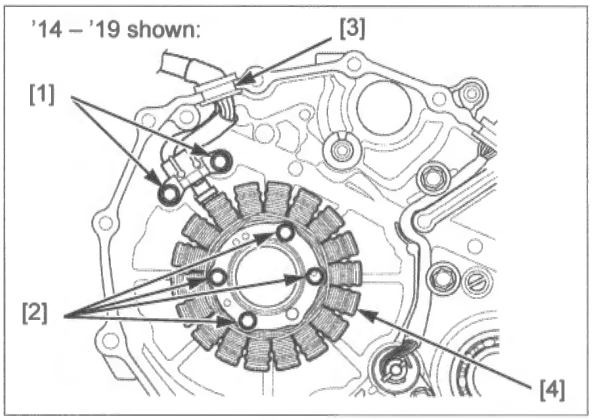
– two dowel pins [1]
– oil joint pipe [2] and O-ring [3]



STATOR AND CKP SENSOR REMOVAL

Remove the following:

– two CKP sensor bolts [1]
– four stator bolts [2]
– grommet [3]
– stator/CKP sensor assembly [4]



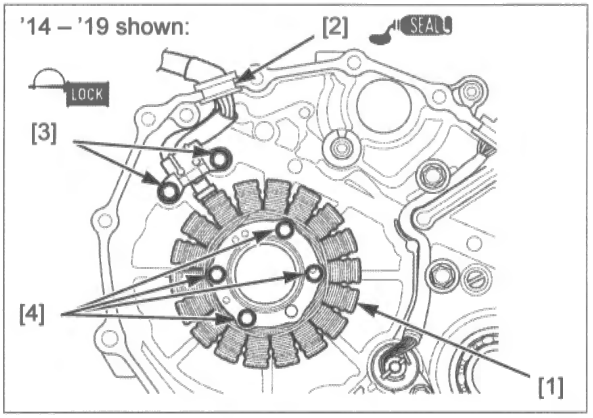
STATOR AND CKP SENSOR INSTALLATION

Set the stator/CKP sensor assembly [1] onto the rear crankcase cover.

Apply sealant to the seating surface of the grommet [2] and install the grommet into the cover groove securely.

Apply locking agent to the threads of the CKP sensor bolt [3] (page 1-17).
Install the stator bolts [4] and CKP sensor bolts, and tighten them to the specified torque.

TORQUE:
CKP sensor bolt: 6 N·m (0.6 kgf·m, 4.4 lbf·ft)
Stator mounting bolt:
FM/FE models: 12 N·m (1.2 kgf·m, 9 lbf·ft)
FA models: 10 N·m (1.0 kgf·m, 7 lbf·ft)



BEARING REPLACEMENT

INSPECTION

Turn the inner race of the bearing with your finger. The bearing should turn smoothly and quietly.
Also check that the bearing outer race fits tightly in the rear crankcase cover.

Replace the bearing if the inner race does not turn smoothly, quietly or if the outer race fits loosely in the cover.

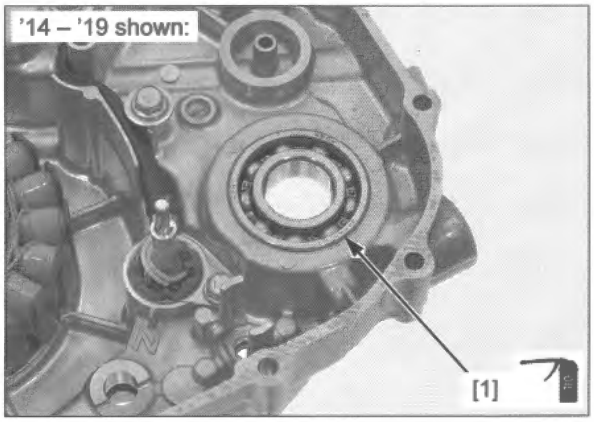
OUTPUT SHAFT BEARING

Drive the bearing out of the cover.

Apply engine oil to a new bearing.
Drive the bearing into the cover with the marked side facing up.

TOOLS:

Driver	**07749-0010000**
Attachment, 52 x 55 mm	**07746-0010400**
Pilot, 25 mm	**07746-0040600**



CRANKSHAFT BEARING

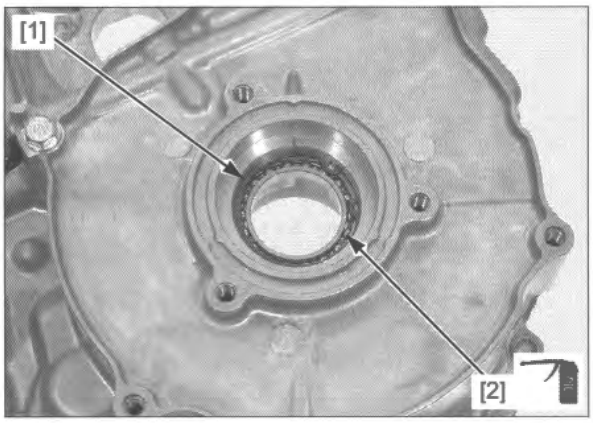
Remove the crankshaft hole cap.

Remove the snap ring [1] and bearing [2].

Apply engine oil to a new bearing.
Install the bearing and snap ring.

- Make sure the snap ring is firmly seated in the groove.

Install the crankshaft hole cap.



REAR CRANKCASE COVER INSTALLATION

FM/FE models

Clean the mating surfaces of the crankcase and rear crankcase cover thoroughly, being careful not to damage them.

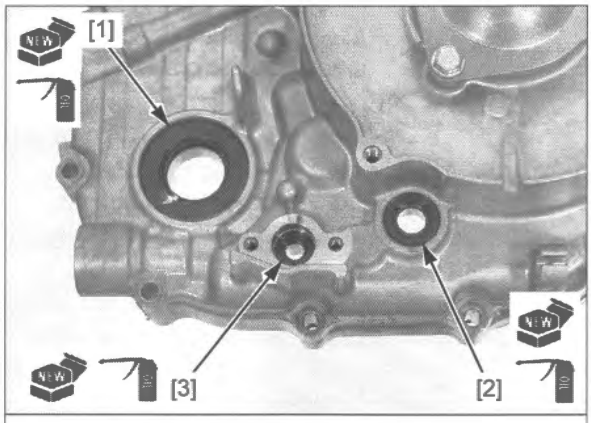
Blow through the oil passage in the rear crankcase cover with compressed air.

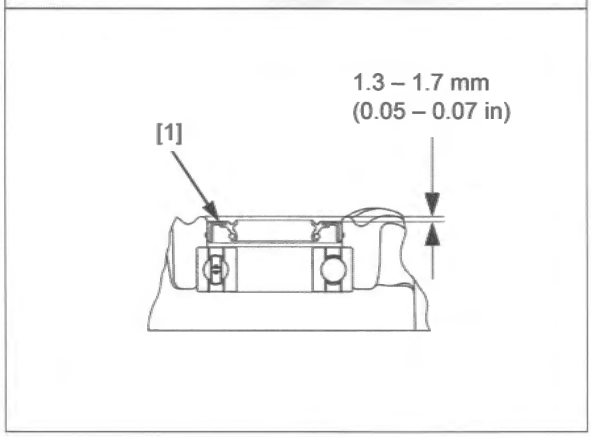
Install a new output shaft oil seal [1] until the depth from the outer surface is 1.3 – 1.7 mm (0.05 – 0.07 in).

Install the following:

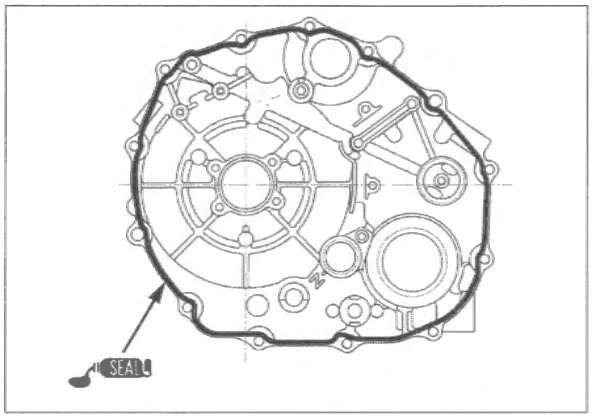
- new reverse lock lever oil seal [2]
- FE models only: new gearshift spindle oil seal [3]

Apply engine oil to the oil seal lips.





Apply liquid sealant (TB1215 or equivalent) to the mating surface (shadowed area) of the rear crankcase cover as shown.

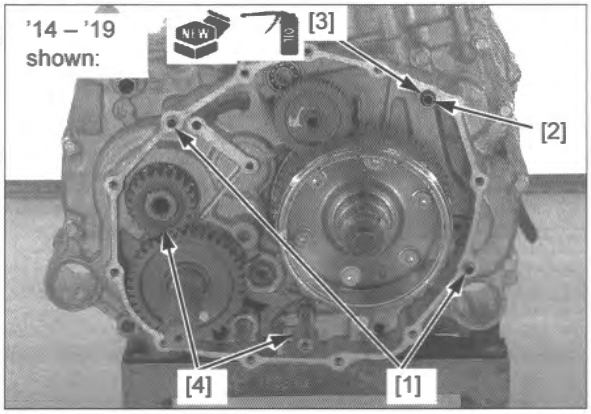


FM models (All)/FE models ('14 – '19):

Install the two dowel pins [1] and oil joint pipe [2].
Coat a new O-ring [3] with engine oil and install it onto the oil joint pipe.
Install the thrust washers [4] onto the countershaft and reverse stopper shaft.

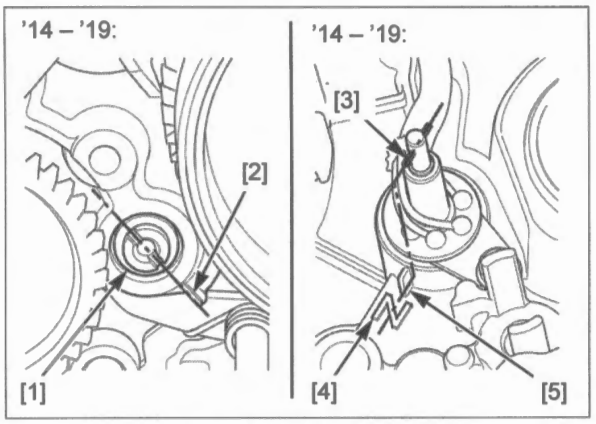
After '19 FE2:

Install the two dowel pins [1] and oil joint pipe [2].
Coat a new O-ring [3] with engine oil and install it onto the oil joint pipe.



FM models (All)/FE models ('14 – '19): Shift the transmission into neutral to align the groove in the shift drum [1] with the lug [2] on the crankcase.

FM models (All)/FE models ('14 – '19): Align the long end [3] of the gear position switch pin with the "N" mark [4] (lug [5]) on the rear crankcase cover.



The cover (stator) is magnetically attracted to the flywheel, be careful not to get anything caught between these parts when installing.

Install the rear crankcase cover aligning the switch pin with the shift drum groove properly, being careful not to damage the switch pin and oil seal lips.

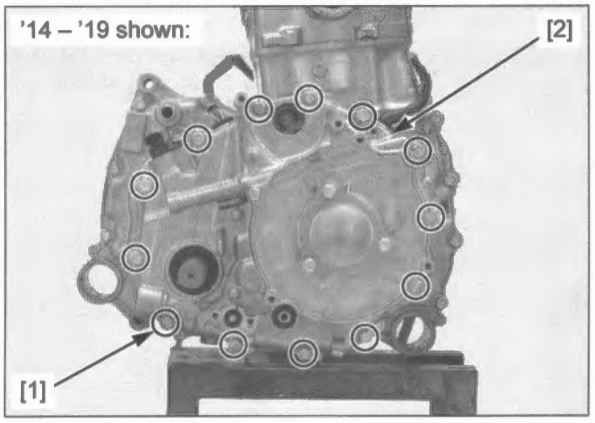
NOTE:

- Except FE models: Align the arm of gearshift spindle A with the arm hole in the gearshift spindle when installing the cover.

If the cover doesn't install easily, remove it and check the alignment of the switch pin and the shift drum or the switch for damage.

After installing the crankcase cover, make sure that the oil seals in the cover are not turned inside out.

Install the thirteen bolts [1] and tighten them in a crisscross pattern in several steps.



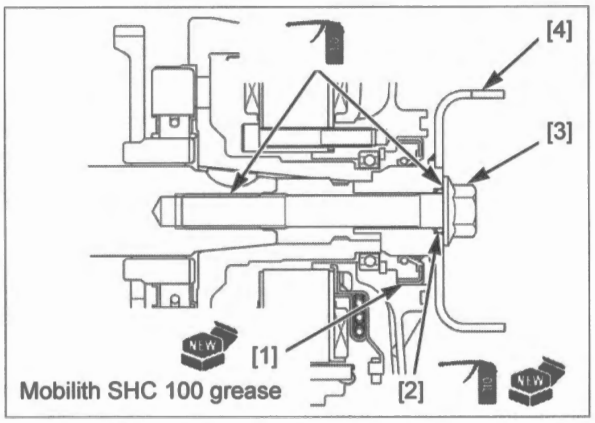
CM/ III A types: Apply specified grease to the lips of a new oil seal [1] and install it into the crankcase cover until it is fully seated.

SPECIFIED GREASE: Mobilith SHC 100 (EXXON)

Coat a new O-ring [2] with engine oil and install it onto the pulley bolt flange.

Apply engine oil to the threads and seating surface of the pulley bolt [3].

Install the driven pulley [4] with the bolt, aligning the bosses with the grooves in the crankshaft.



CM/ III A types: Hold the driven pulley using the special tool and tighten the bolt.

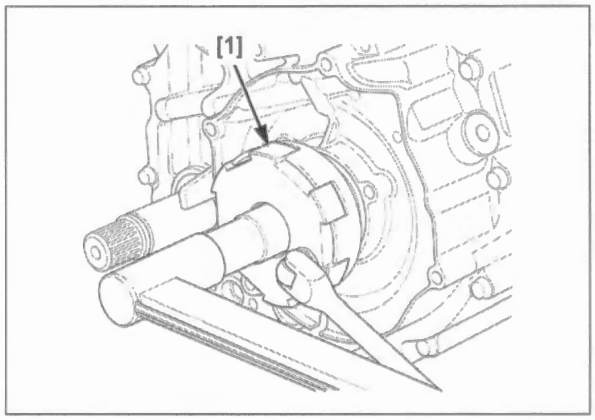
TOOL:
[1] Recoil Pulley Holder 07SMB-HM70100

TORQUE: 108 N·m (11.0 kgf·m, 80 lbf·ft)

Install the following:

- FE2 models only: TR sensor (After '19) (page 25-32)
- FE2 models only: neutral switch (After '19) (page 25-33)
- FE models only: shift spindle angle sensor (page 25-31)
- CM/ III A types: recoil starter (page 15-8)
- starter motor (page 6-7)
- FM1/FM2/FE1/FE2: swingarm (page 19-9)

FM5/FM6/FM7: Connect the rear propeller shaft (page 14-11).

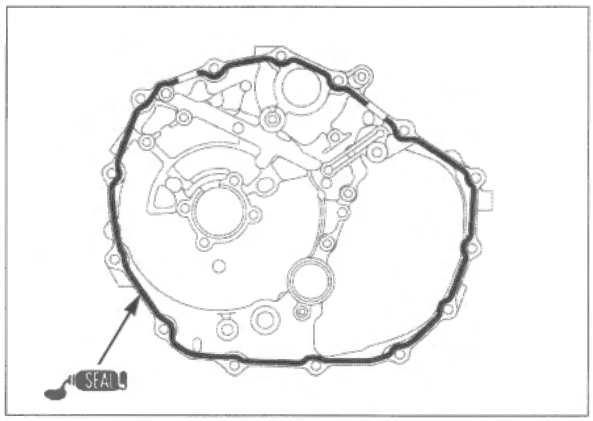


FA models:

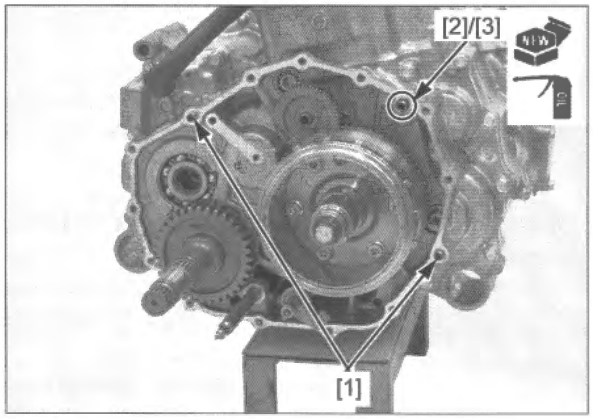
Clean the mating surfaces of the crankcase and rear crankcase cover thoroughly, being careful not to damage them.

Blow through the oil passage in the rear crankcase cover with compressed air.

Apply liquid sealant (TB1215 or equivalent) to the mating surface (shadowed area) of the rear crankcase cover as shown.



Install the two dowel pins [1] and oil joint pipe [2].
Coat a new O-ring [3] with engine oil and install it onto the oil joint pipe.



'15 – '19: Apply engine oil to the lips of a new reverse lock lever oil seal [1] and install it.

'15 – '19: Shift the transmission into neutral to align the groove in the shift drum [2] with the lug [3] on the crankcase.

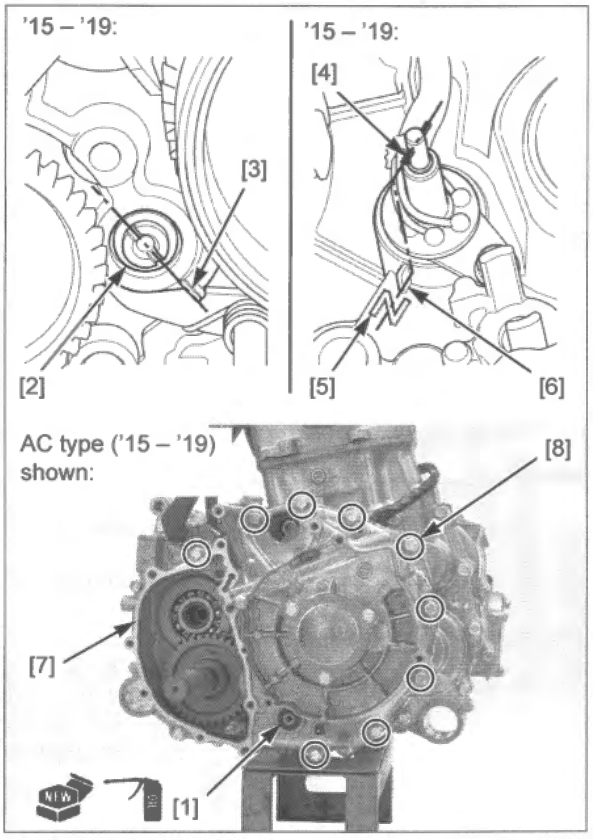
'15 – '19: Align the long end [4] of the gear position switch pin with the "N" mark [5] (lug [6]) on the rear crankcase cover.

The cover (stator) is magnetically attracted to the flywheel, be careful not to get anything caught between these parts when installing.

Install the rear crankcase cover [7] aligning the switch pin with the shift drum groove properly, being careful not to damage the switch pin and oil seal lips.

If the cover doesn't install easily, remove it and check the alignment of the switch pin and the shift drum or the switch for damage.

Install the nine bolts [8] and tighten them in a crisscross pattern in several steps.



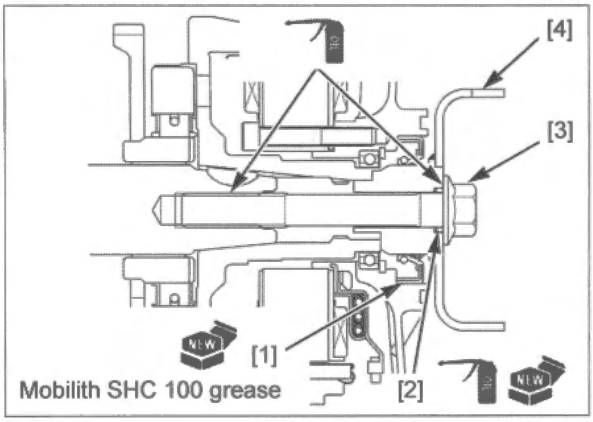
CM/ III A types: Apply specified grease to the lips of a new oil seal [1] and install it into the crankcase cover until it is fully seated.

SPECIFIED GREASE: Mobilith SHC 100 (EXXON)

Coat a new O-ring [2] with engine oil and install it onto the pulley bolt flange.

Apply engine oil to the threads and seating surface of the pulley bolt [3].

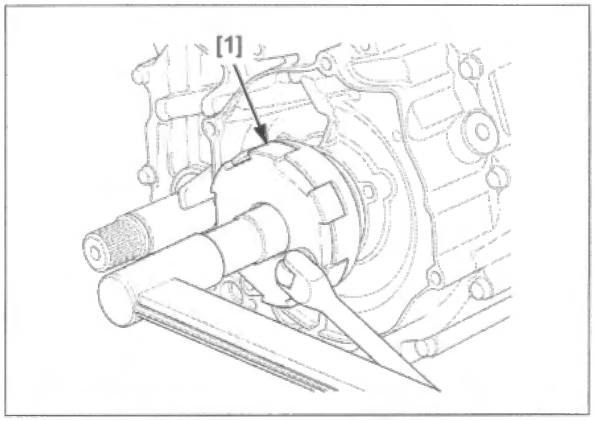
Install the driven pulley [4] with the bolt, aligning the bosses with the grooves in the crankshaft.



CM/ III A types: Hold the driven pulley using the special tool and tighten the bolt.

TOOL:
[1] Recoil Pulley Holder 07SMB-HM70100

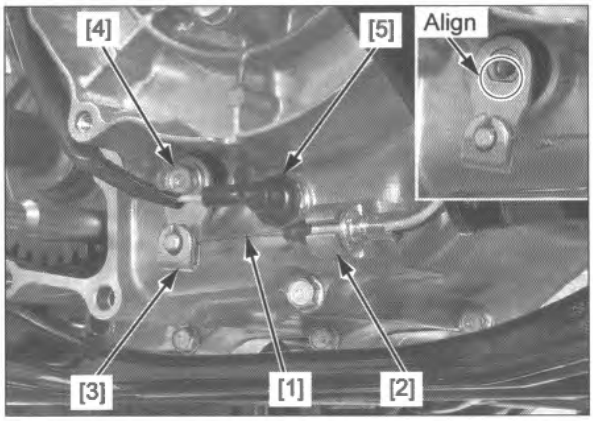
TORQUE: 108 N·m (11.0 kgf·m, 80 lbf·ft)



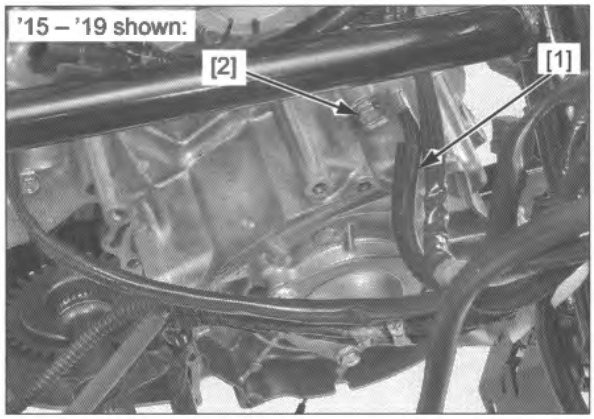
'15 – '19: Install the reverse cable [1] into the cable holder [2] of the engine.
Connect the cable end to the reverse arm [3], then install the arm to the spindle while aligning the flats as shown.

Install and tighten the bolt [4].

Connect the reverse switch terminal [5] to the switch.

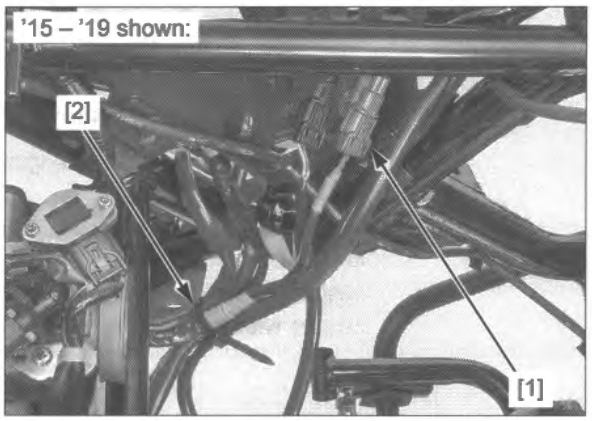


Set the terminal of battery (–) cable [1], then install and tighten the bolt [2].



Connect the CKP sensor 2P (Gray) connector [1].

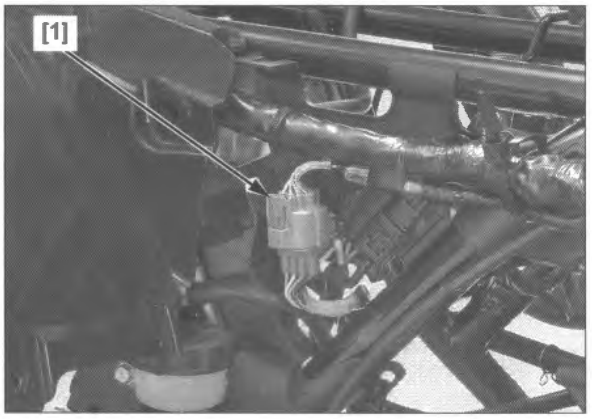
'15 – '19: Install the wire band [2].



Connect the shift drum position switch 10P (Gray) connector [1] ('14 – '19).

Install the following:

- TR sensor (After '19) (page 13-58)
- neutral switch (After '19) (page 13-58)
- sub-transmission (page 14-11)
- shift spindle angle sensor (page 13-57)
- CM/ III A types: recoil starter (page 15-8)
- starter motor (page 6-7)
- center mudguards (page 2-5)

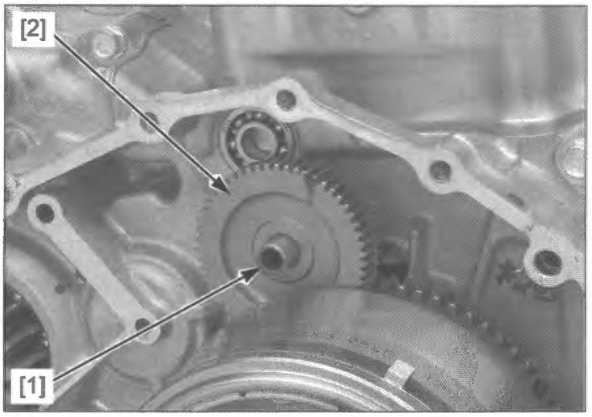


FLYWHEEL/STARTER CLUTCH

REMOVAL

Remove the rear crankcase cover (page 15-8).

Remove the starter reduction gear shaft [1] and gear [2].



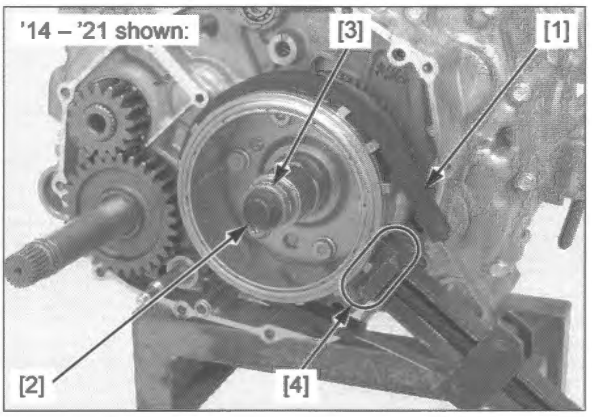
Except CM/ III A types: Hold the flywheel using the special tool [1] and remove the flywheel bolt [2] and collar [3].

NOTE:

Set the holding block [4] of the special tool avoiding the flywheel reluctors.

TOOL:

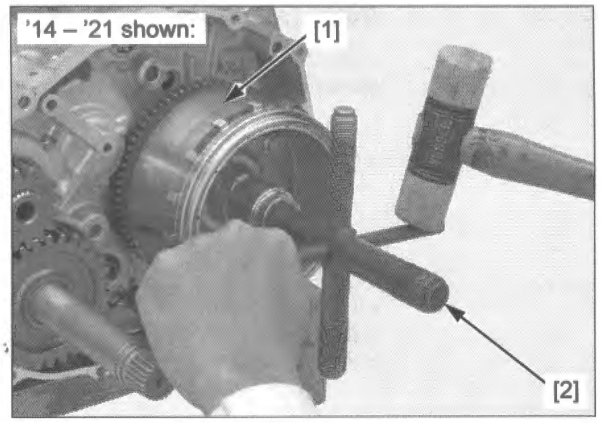
Holder Flywheel	**07725-0040001 or equivalent commercially available in U.S.A.**



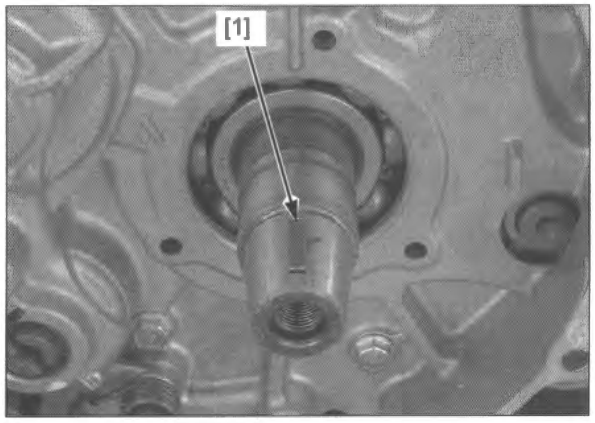
Hold the flywheel [1] and remove it from the crankshaft using the special tool.

TOOL:

[2] Outside Screw Puller	**07733-0020001 or 07933-3000001 (U.S.A. only)**



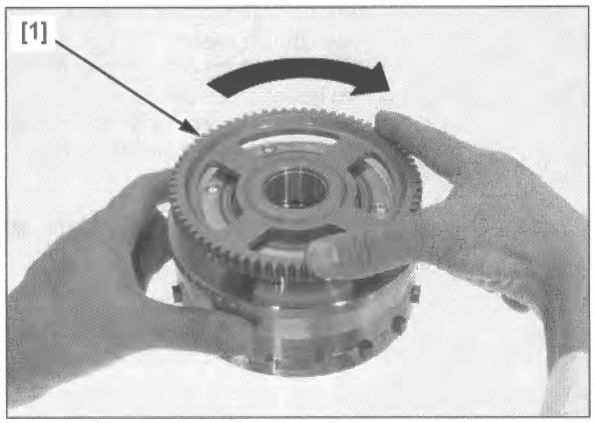
Remove the woodruff key [1] from the crankshaft.



STARTER CLUTCH DISASSEMBLY

Make sure that the starter driven gear [1] turns clockwise smoothly and does not turn counterclockwise.

Remove the driven gear while turning it clockwise.



Hold the flywheel with the special tool [1] and remove the starter clutch bolts (T40) [2].

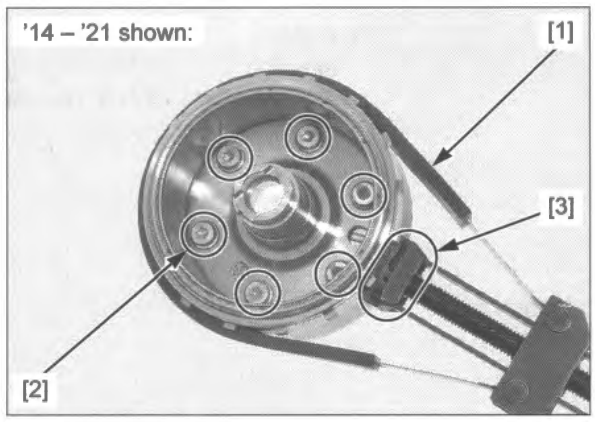
NOTE:

Set the holding block [3] of the special tool avoiding the flywheel reluctors.

TOOL:

Holder Flywheel	**07725-0040001 or equivalent commercially available in U.S.A.**

Remove the starter clutch assembly from the flywheel.



INSPECTION

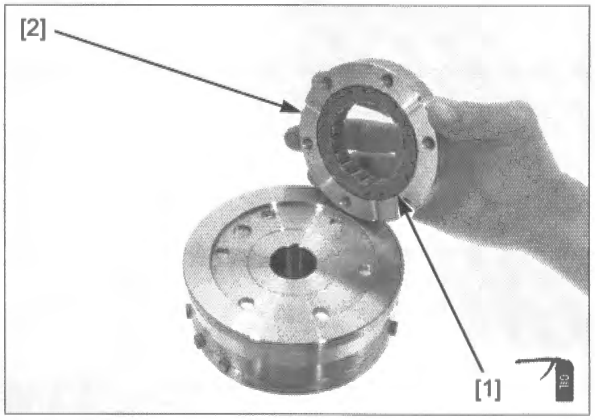
Inspect the following parts for scratches, damage, abnormal wear and deformation. Replace if necessary.

- starter driven gear
- crankshaft
- sprag clutch
- clutch outer
- starter reduction gear
- starter reduction gear shaft

Measure each part according to ALTERNATOR/ STARTER CLUTCH SPECIFICATIONS (page 1-13). Replace any part if it is out of service limit.

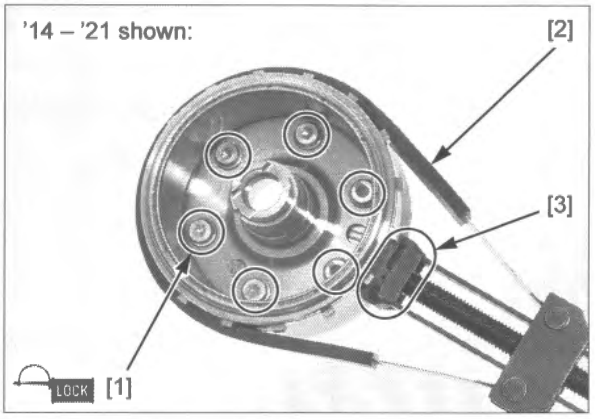
STARTER CLUTCH ASSEMBLY

Lubricate the sprag clutch [1] with engine oil and install it into the clutch outer [2] with the flange facing the flywheel side.
Install the starter clutch onto the flywheel.



Apply locking agent to the threads of the starter clutch (T40) bolt [1] (page 1-17).
Align the bolt holes in the flywheel and starter clutch, and install the bolts.
Hold the flywheel with the special tool [2] and tighten the bolts to the specified torque.

NOTE:
Set the holding block [3] of the special tool avoiding the flywheel reluctors.



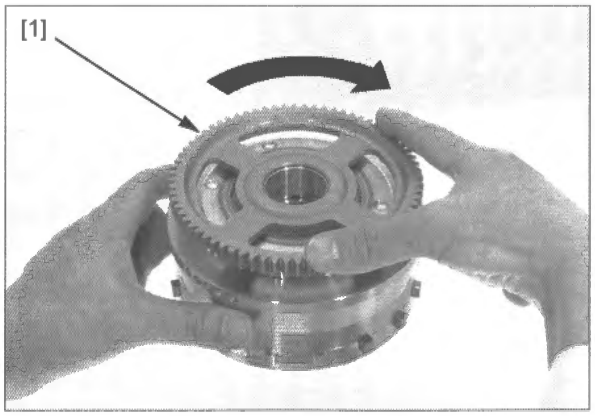
TOOL:

Holder Flywheel	**07725-0040001 or equivalent commercially available in U.S.A.**

TORQUE:

'14 – '21:	**37 N·m (3.8 kgf·m, 27 lbf·ft)**
After '21:	**23 N·m (2.3 kgf·m, 17 lbf·ft)**

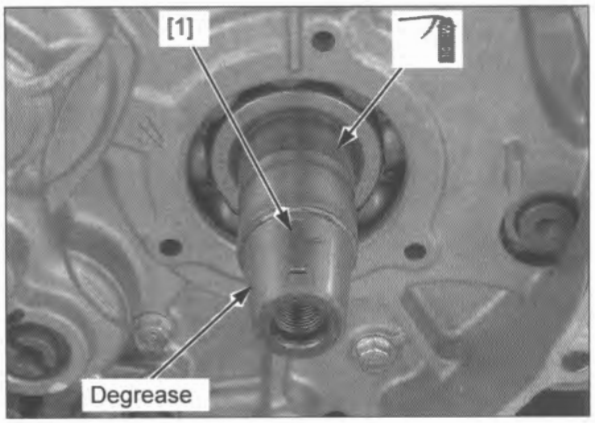
Install the starter driven gear [1] while turning it clockwise.



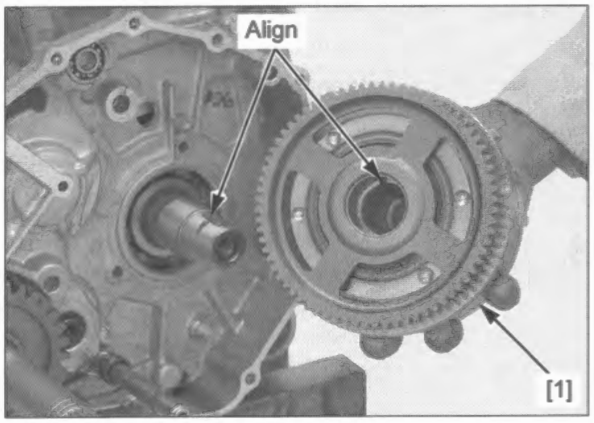
INSTALLATION

Install the woodruff key [1] into the key groove.

Apply molybdenum oil solution to the starter driven gear sliding surface of the crankshaft.
Clean any oil from the tapered portions of the crankshaft and flywheel.



Install the flywheel [1] aligning the key way with the key on the crankshaft.

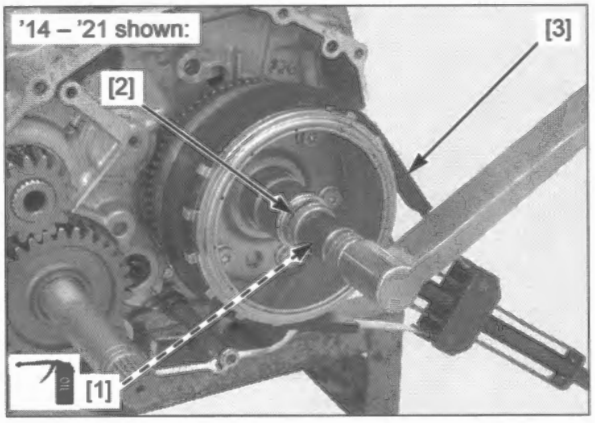


Except CM/ III A types: Apply engine oil to the threads and seating surface of the flywheel bolt [1].
Install the collar [2] by aligning the lugs with the grooves in the flywheel properly, and install the flywheel bolt.
Hold the flywheel using the special tool [3] and tighten the flywheel bolt.

NOTE:
Set the holding block of the special tool avoiding the flywheel reluctors.

TOOL:

Holder Flywheel	**07725-0040001 or equivalent commercially available in U.S.A.**



TORQUE: 108 N·m (11.0 kgf·m, 80 lbf·ft)

CM/ III A types: Temporarily tighten the pulley bolt to seat the flywheel as follows:

Apply engine oil to the threads and seating surface of the pulley bolt [1].

Install the driven pulley [2], aligning the bosses with the grooves in the crankshaft, and secure it with the bolt.

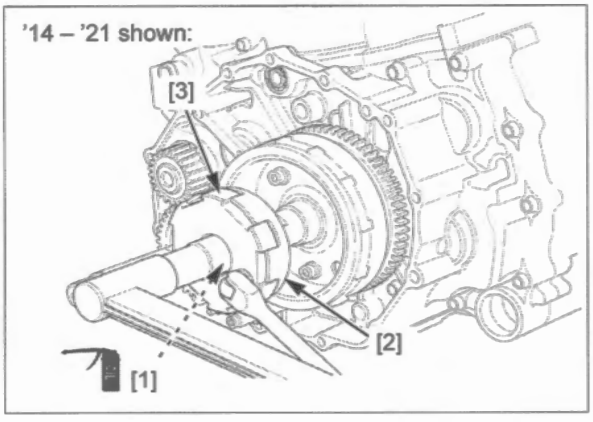
Hold the driven pulley using the special tool and tighten the bolt.

TOOL:

[3] Recoil Pulley Holder	**07SMB-HM70100**

TORQUE: 108 N·m (11.0 kgf·m, 80 lbf·ft)

Loosen the pulley bolt. Remove the tool, bolt and pulley.

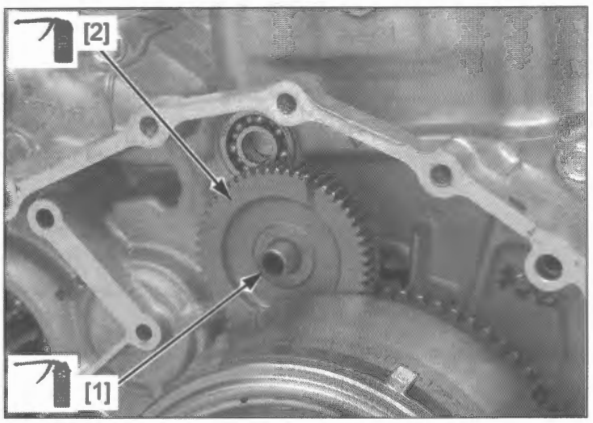


Apply molybdenum oil solution to the starter reduction gear shaft [1].

Apply engine oil to the reduction gear teeth [2].

Install the gear and shaft.

Install the rear crankcase cover (page 15-14).



STARTER MOTOR BEARING REPLACEMENT

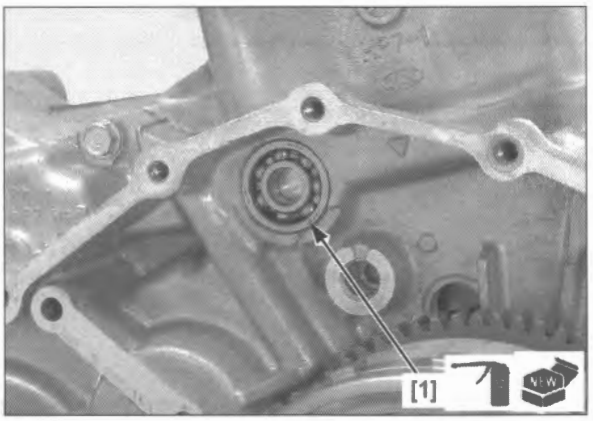
Remove the rear crankcase cover (page 15-8).

Remove the starter reduction gear shaft and gear (page 15-18).

Turn the inner race of the bearing [1] with your finger. The bearing should turn smoothly and quietly.
Also check that the bearing outer race fits tightly in the rear crankcase cover.

Replace the bearing if the inner race does not turn smoothly, quietly or if the outer race fits loosely in the cover.

Remove the bearing using the special tools.



TOOLS:

Remover Shaft, 10 mm	**07936-GE00100**
Remover Head, 10 mm	**07936-GE00200**
Remover Weight	**07741-0010201**

U.S.A. TOOLS:

Bearing remover, 10 mm	**07936-GE0A000**
Bearing handle	**07936-3710100**
Remover weight	**07936-371020A**

Apply engine oil to a new bearing.
Drive a new bearing into the crankcase with the marked side facing out, using the special tools.

TOOLS:

Driver	**07749-0010000**
Attachment, 24 x 26 mm	**07746-0010700**
Pilot, 10 mm	**07746-0040100**

Apply molybdenum oil solution to the starter reduction gear shaft, and install the gear and shaft (page 15-18).

Install the rear crankcase cover (page 15-14).

16. CRANKCASE/TRANSMISSION/CRANKSHAFT/BALANCER

SERVICE INFORMATION 16-2

TROUBLESHOOTING 16-4

SYSTEM COMPONENTS 16-5

CRANKCASE SEPARATION 16-6

TRANSMISSION 16-7

CRANKSHAFT/BALANCER 16-13

CRANKCASE BEARING 16-15

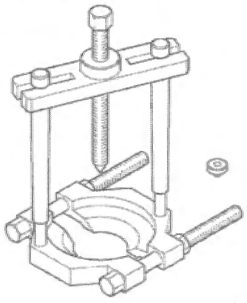
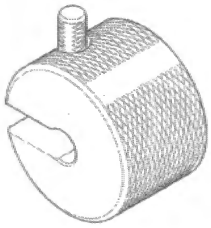
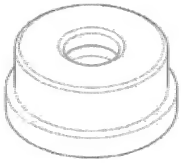
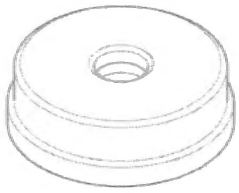
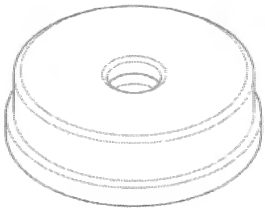
CRANKCASE ASSEMBLY 16-20

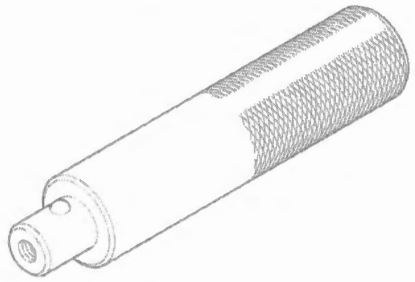
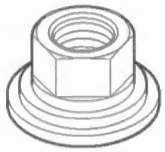
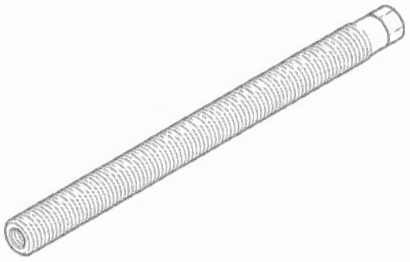
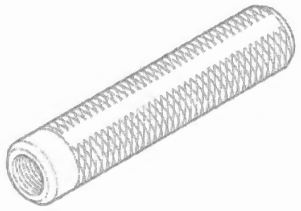
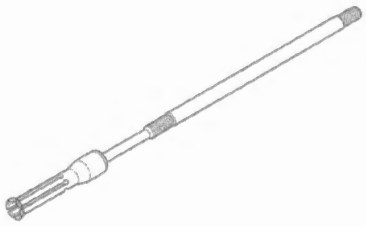
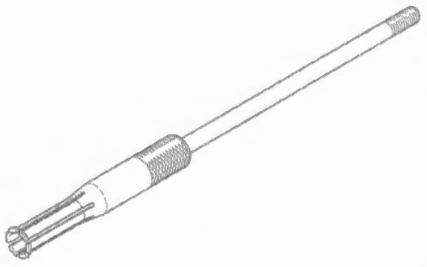
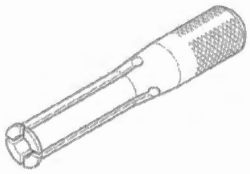
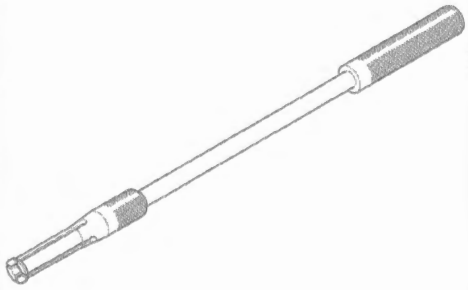
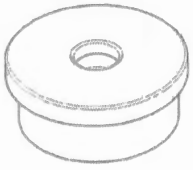
SERVICE INFORMATION

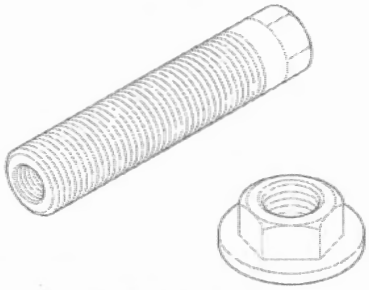
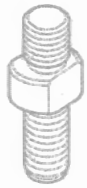
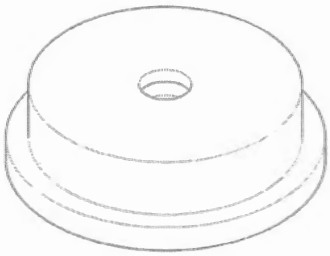
GENERAL

- The crankcase halves must be separated to service the transmission and crankshaft. To service these parts, the engine must be removed from the frame (page 17-4).
- Be careful not to damage the crankcase mating surfaces when servicing.
- Engine lubricating oil is fed through the oil passages in the crankcase. Clean the oil passages before assembling the crankcase halves.

TOOLS

Bearing Separator Set 07631-0010000  or equivalent commercially available in U.S.A.	Remover Weight 07741-0010201  or 07936-371020A (U.S.A. only)	Attachment, 32 x 35 mm 07746-0010100 
Attachment, 37 x 40 mm 07746-0010200 	Attachment, 42 x 47 mm 07746-0010300 	Attachment, 62 x 68 mm 07746-0010500 
Attachment, 72 x 75 mm 07746-0010600 	Pilot, 15 mm 07746-0040300 	Pilot, 17 mm 07746-0040400 
Pilot, 20 mm 07746-0040500 	Pilot, 25 mm 07746-0040600 	Pilot, 35 mm 07746-0040800 

Pilot, 40 mm 07746-0040900 	Pilot, 22 mm 07746-0041000 	Driver 07749-0010000 
Special nut 07931-HB3020A (U.S.A. only) 	Puller shaft 07931-ME4010B (U.S.A. only) 	Remover Handle 07936-3710100 
Bearing Remover Shaft Set, 17 mm 07936-3710300 	Bearing Remover, 20 mm 07936-3710600 	Remover Shaft, 15 mm 07936-KC10100  Not available in U.S.A.
Remover Head, 15 mm 07936-KC10200  Not available in U.S.A.	Bearing remover, 15 mm 07936-KC10500 (U.S.A. only) 	Driver Attachment, Bearing 07946-6920100 

Collar 30.1 x 40/37 x 42.7 07965-VM00100 	Threaded Shaft 12 x 1.25 x 80L 07965-VM00200  Not available in U.S.A.	Threaded Adaptor 12 x 1.25 07965-VM00300  or 07931-KF00200 (U.S.A. only)
Attachment, 78 x 90 mm 07GAD-SD40101 	Pilot, 32 mm 07MAD-PR90200 	Attachment, 24 x 26 mm 07746-0010700 

TROUBLESHOOTING

Excessive engine noise
- Worn, seized or chipped transmission gears
- Worn transmission bearings
- Worn connecting rod big end bearing
- Worn crankshaft main journal bearing
- Worn balancer bearing
- Improper balancer installation

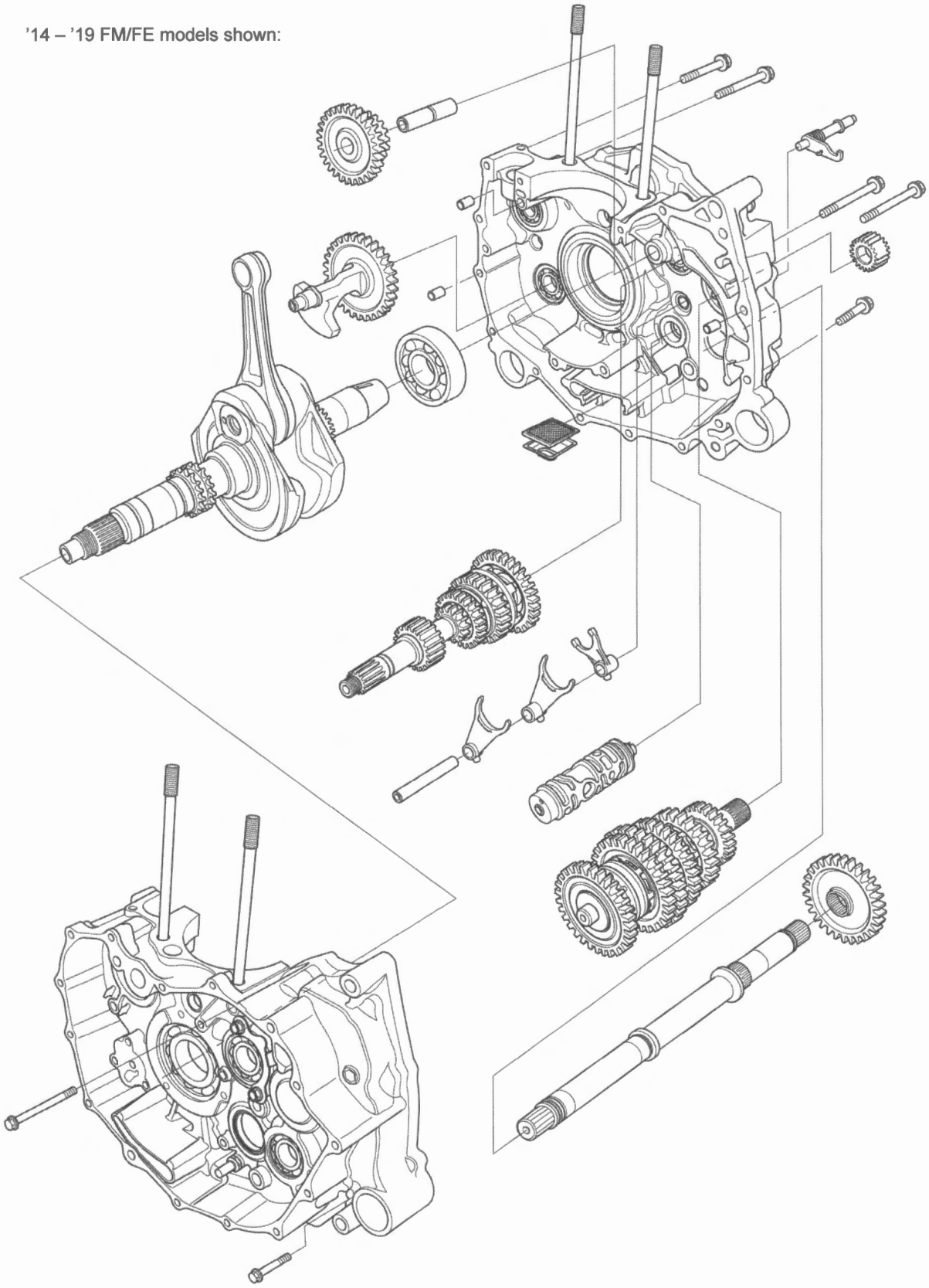
Transmission jumps out of gear
- Worn gear dogs or dog holes
- Worn shift drum guide groove
- Worn shift fork guide pin
- Worn gear shifter groove
- Worn shift fork
- Bent shift fork shaft
- Faulty gearshift linkage (page 12-3)

Hard to shift
- Damaged shift fork
- Bent shift fork shaft
- Damaged shift fork guide pin
- Damaged shift drum guide groove
- Bent gearshift spindle
- Faulty gearshift linkage (page 12-3)

Abnormal vibration
- Improper balancer timing

SYSTEM COMPONENTS

'14 – '19 FM/FE models shown:



CRANKCASE SEPARATION

Remove the following:

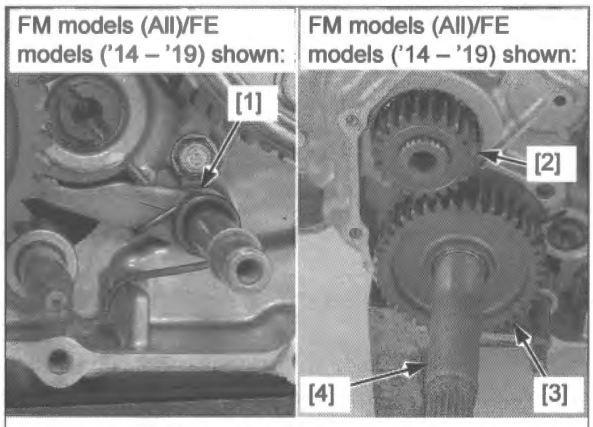
- engine (page 17-4)
- cylinder head (page 10-10)
- cylinder and piston (page 11-4)
- camshaft (page 10-16)
- flywheel and starter clutch (page 15-18)

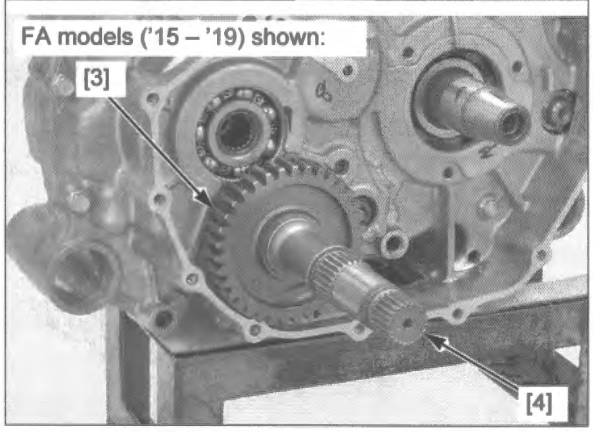
FM models (All)/FE models ('14 – '19):
- gearshift linkage (page 12-18)
- change clutch (page 12-14)
- oil pump (page 9-5)
- reverse stopper shaft/spring assembly [1]
- output shaft drive gear [2], driven gear [3] and output shaft [4]

FE2 (After '19):
- gearshift linkage (page 12-18)
- change clutch (page 12-14)
- oil pump (page 9-5)
- output shaft drive gear, driven gear and output shaft

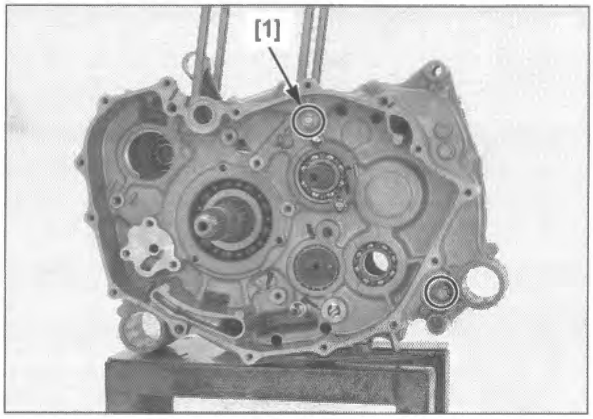
FA models ('15 – '19):
- dual clutch/primary driven gear (page 13-74)
- gearshift linkage (page 13-84)
- reverse stopper shaft/spring assembly (page 13-87)
- driven gear [3] and output shaft [4]

FA models (After '19):
- dual clutch/primary driven gear (page 13-74)
- gearshift linkage (page 13-84)
- driven gear and output shaft





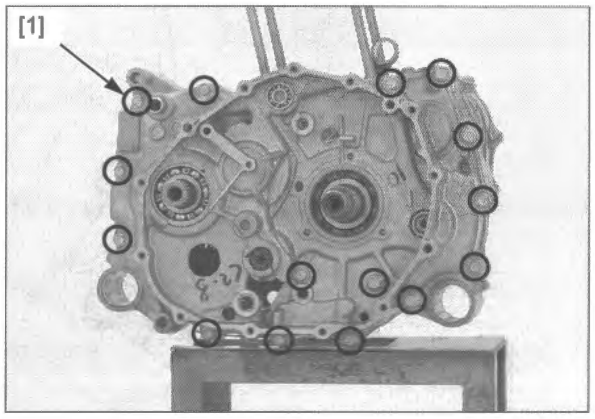
- two front crankcase bolts [1]



Loosen the crankcase bolts in a crisscross pattern in several steps.

- fifteen rear crankcase bolts [1]

Place the crankcase assembly with the rear crankcase down.

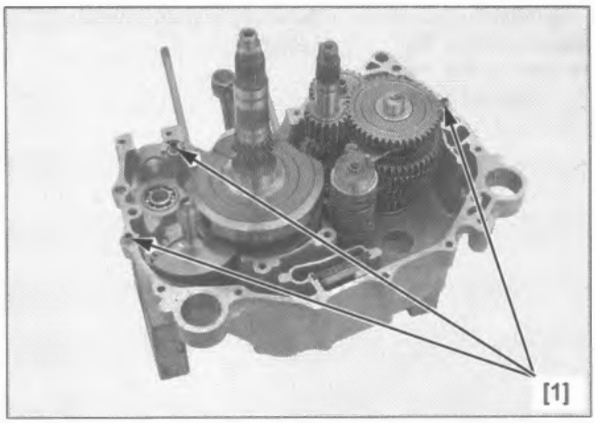


Do not pry the crankcase apart with a screwdriver.

Remove the front crankcase while tapping it at several locations with a soft hammer.

Remove the three dowel pins [1].

Remove any sealant material from the crankcase mating surfaces.



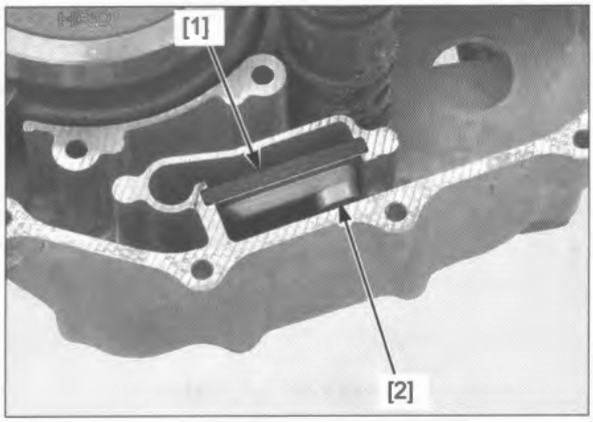
OIL STRAINER CLEANING

Remove the oil strainer [1] and strainer plate [2].

Wash the strainer thoroughly in non-flammable or high flash point solvent until all accumulated dirt has been removed.
Blow dry the strainer with compressed air completely.

Before installing the strainer, the screen mesh should be examined closely for damage.

Install the strainer and plate with the wedge facing the crankcase.



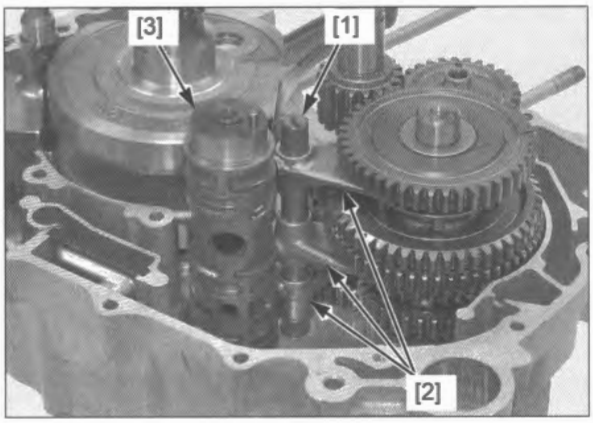
TRANSMISSION

DISASSEMBLY

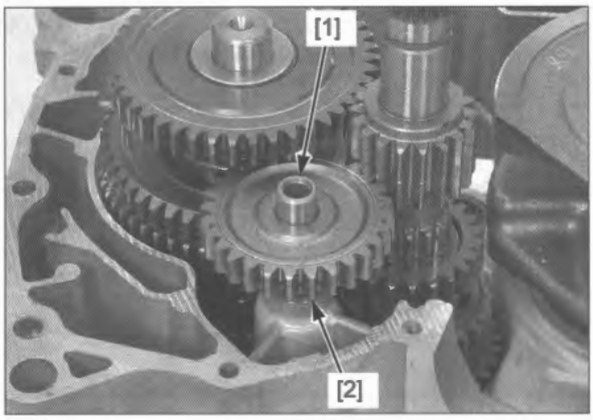
Separate the crankcase (page 16-6).

Remove the following:

- shift fork shaft [1]
- shift forks [2]
- shift drum [3]

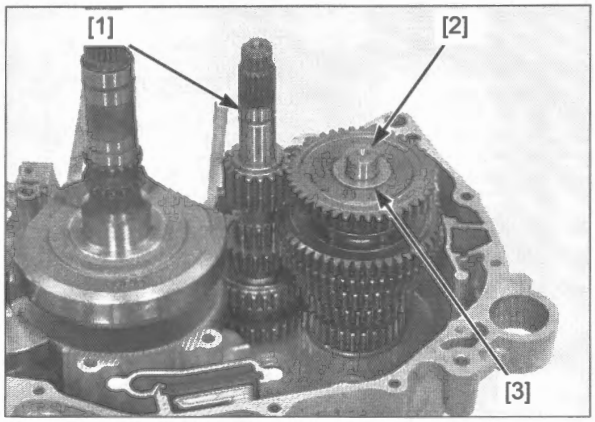


- reverse idle shaft [1] and idle gear [2]



Position the crank weights so that they do not interfere with the mainshaft gears.

– mainshaft [1], countershaft [2] and washer [3] as an assembly



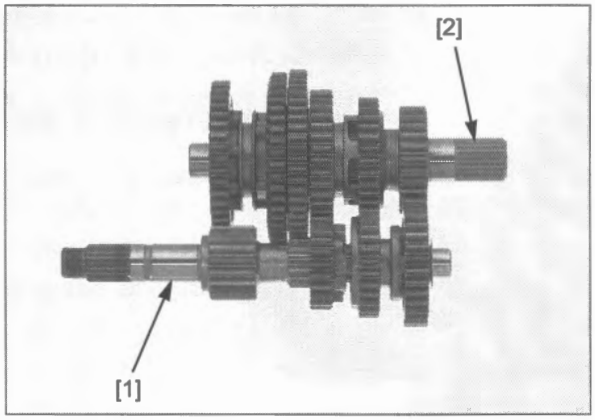
Do not expand the snap ring more than necessary for removal.

Disassemble the mainshaft [1] and countershaft [2].

Clean all disassembled parts in solvent thoroughly.

NOTE:

- Keep track of the disassembled parts (gears, bushings, washers and snap ring) by sliding them onto a tool or slipping them onto a piece of wire.

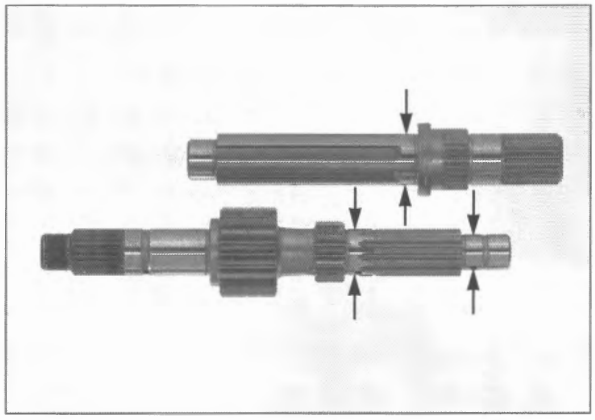


INSPECTION

Inspect the following parts for scratches, damage, abnormal wear and deformation. Replace if necessary.

– transmission gears
– transmission bushings
– transmission bearings
– shift drum/journal
– shift forks
– shift fork shaft
– output shaft
– output shaft drive/driven gears

Measure each part according to CRANKCASE/TRANSMISSION/CRANKSHAFT/BALANCER SPECIFICATIONS (page 1-14).



ASSEMBLY

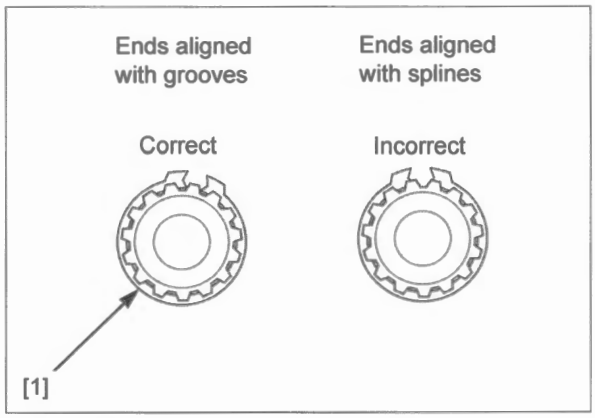
NOTE:

- Always install the thrust washers and snap ring with the chamfered (rolled) edge facing away from the thrust load.
- Install the snap ring [1] so its ends aligns with the grooves in the splines.
- Make sure the snap ring is fully seated in the shaft groove after installing it.

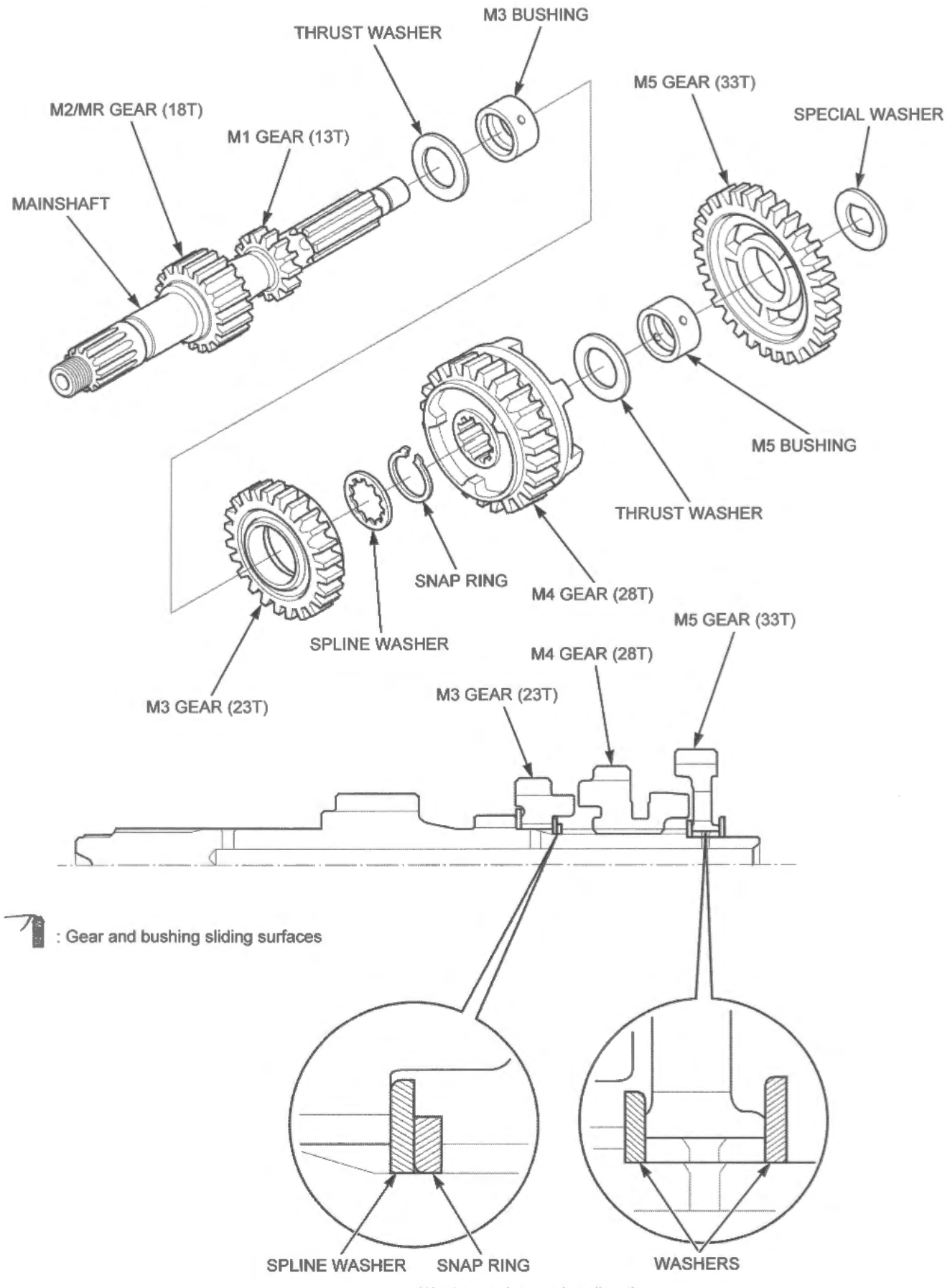
Clean all parts in solvent and dry them thoroughly.

Apply molybdenum oil solution to the gear and bushing sliding surfaces.

Assemble the mainshaft and countershaft.

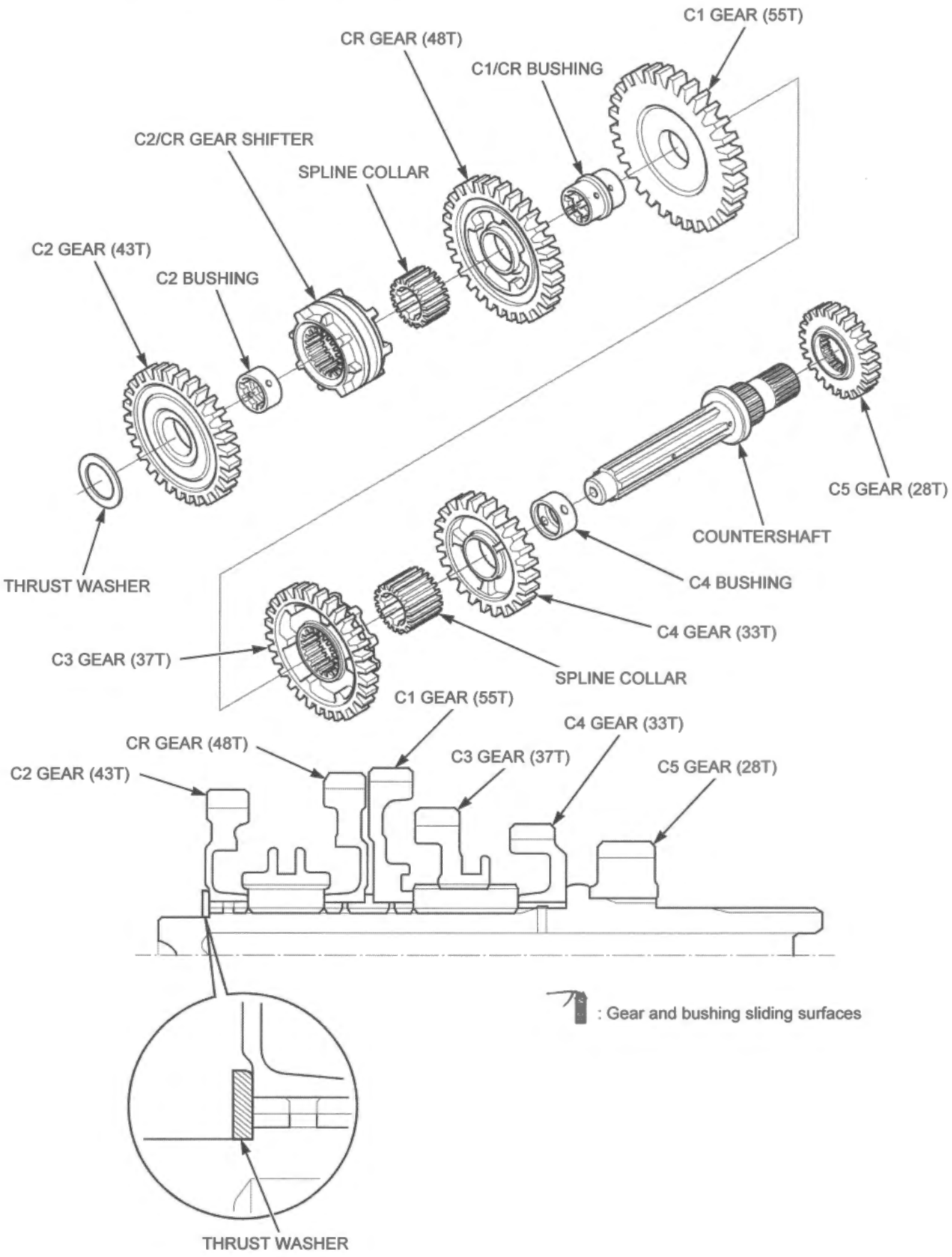


MAINSHAFT (FM/FE models)



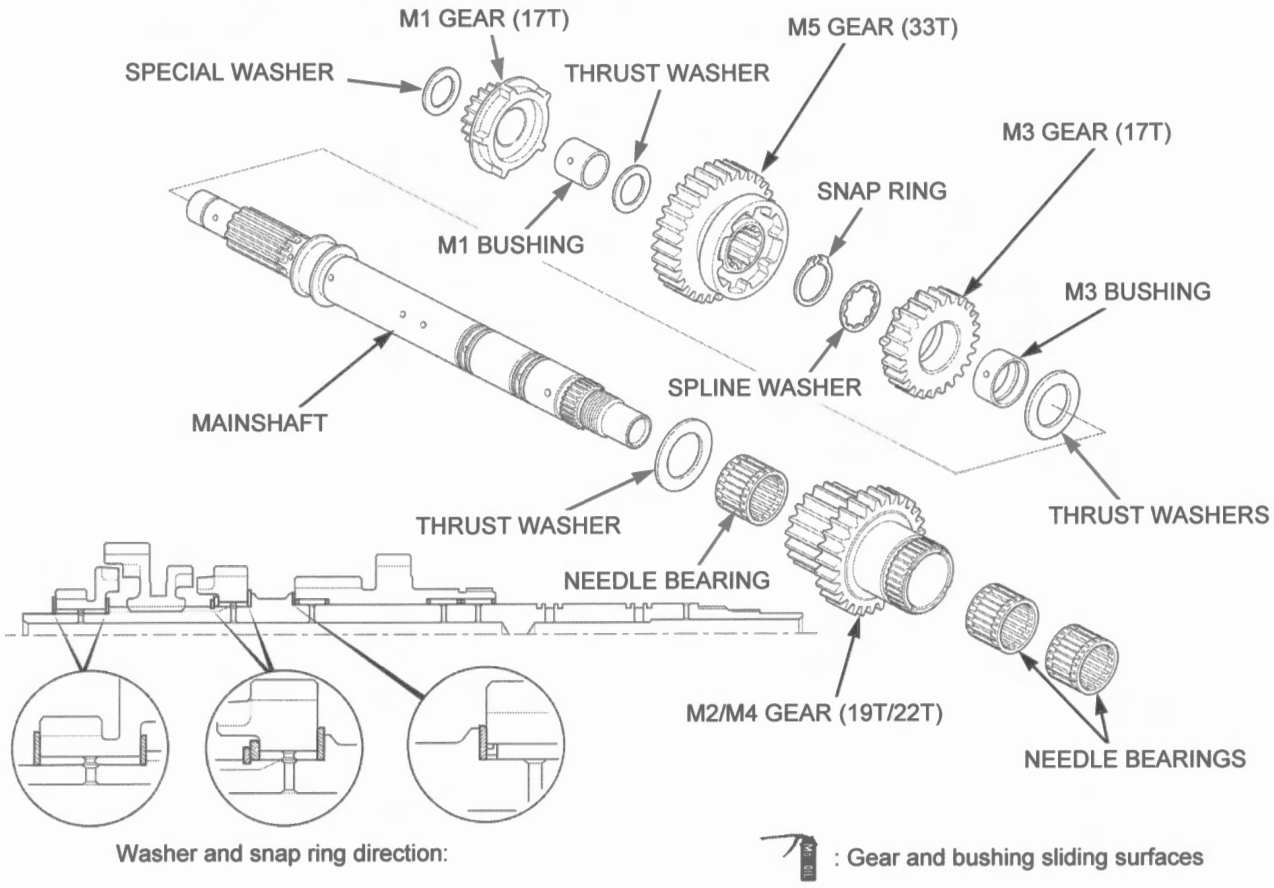
Washer and snap ring direction:

COUNTERSHAFT (FM/FE models)

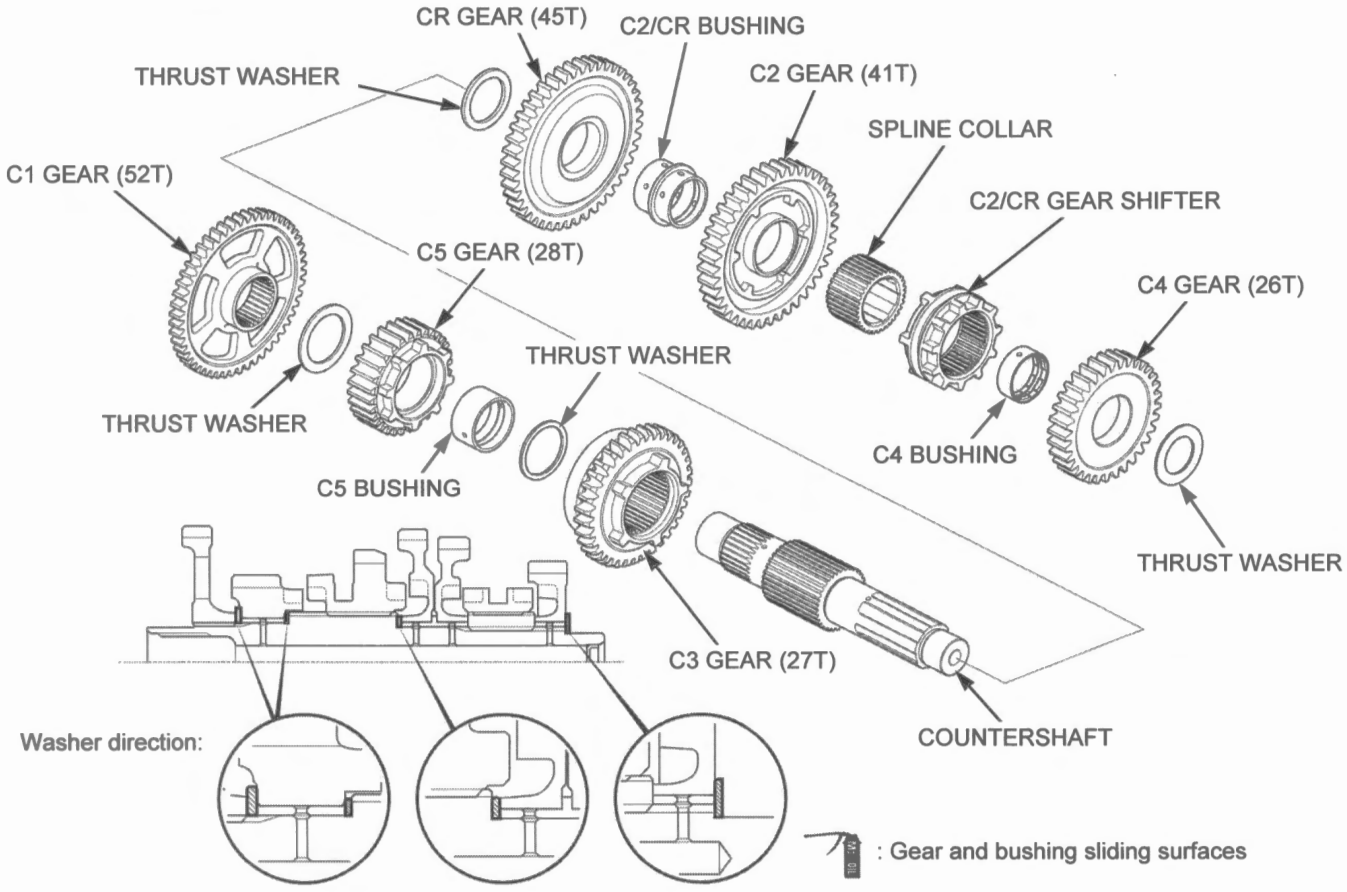


Washer direction:

MAINSHAFT (FA models)

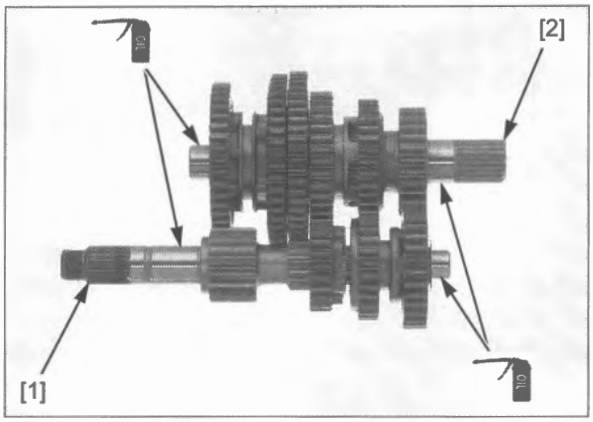


COUNTERSHAFT (FA models)



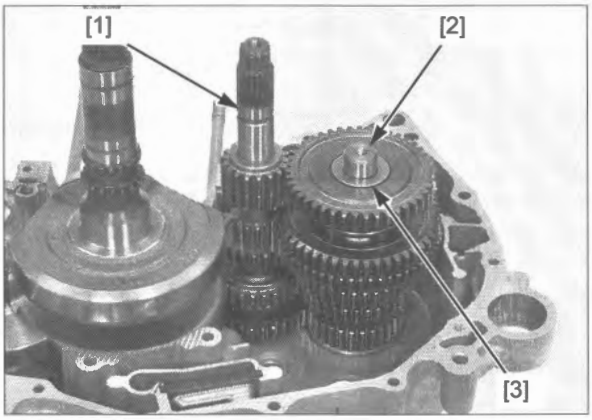
Check the gears for freedom of movement or rotation on the shaft.

Apply engine oil to the journals of the mainshaft [1] and countershaft [2].
Engage the mainshaft and countershaft gears.



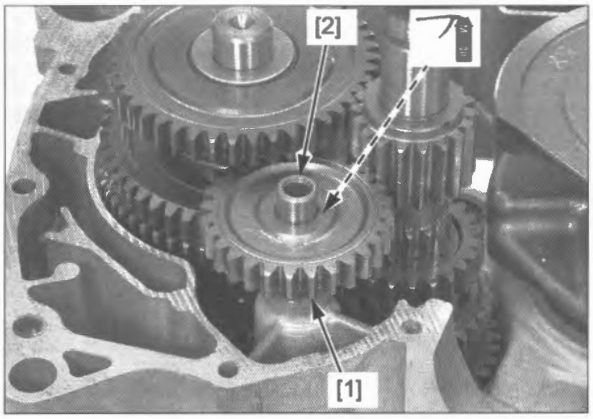
Position the crank weights so that they do not interfere with the mainshaft [1].

Install the mainshaft, countershaft [2] and washer [3] assemblies as a set into the rear crankcase.

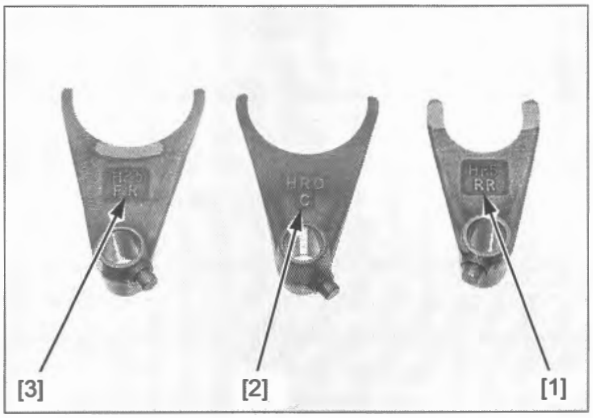


Apply molybdenum oil solution to the sliding surface of the reverse idle gear [1].

Install the reverse idle gear and shaft [2].



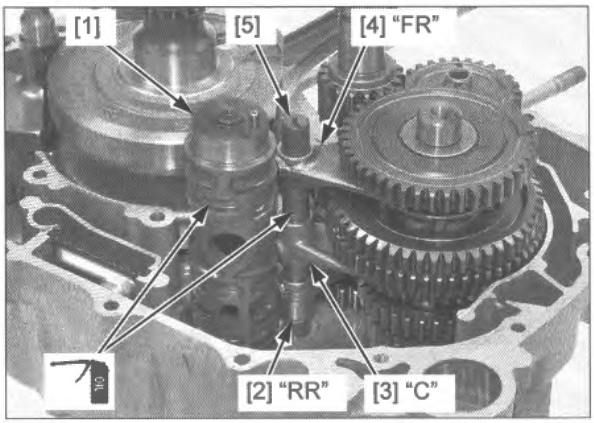
Each shift fork has an identification mark; "RR" [1] for the rear fork, "C" [2] for the center fork and "FR" [3] for the front fork.



Apply engine oil to the shift drum grooves for the guide pin and install the shift drum [1].

Install each shift fork into the gear shifter grooves and shift drum groove with their identification marks facing up (front crankcase side).

- FM/FE models:
  - rear shift fork [2] into the M4 gear
  - center shift fork [3] into the C3 gear
  - front shift fork [4] into the C2/CR gear shifter
- FA models:
  - rear shift fork [2] into the M5 gear
  - center shift fork [3] into the C3 gear
  - front shift fork [4] into the C2/C4 gear shifter



Apply engine oil to the fork shaft [5].
Install the fork shaft through the shift forks and into the crankcase.

Assemble the crankcase halves (page 16-20).

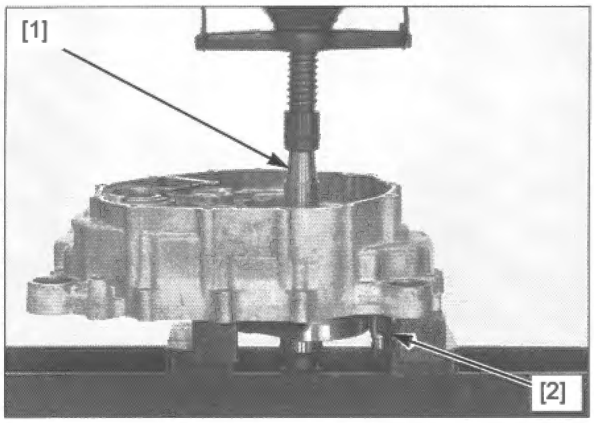
CRANKSHAFT/BALANCER

REMOVAL

Separate the crankcase halves (page 16-6).
Remove the transmission (page 16-7).

Be careful not to damage the crankcase mating surface and crankshaft assembly.

Remove the crankshaft [1] and balancer [2] from the rear crankcase using a hydraulic press.
Be sure to hold the crankshaft and balancer while pressing them out of the crankcase.



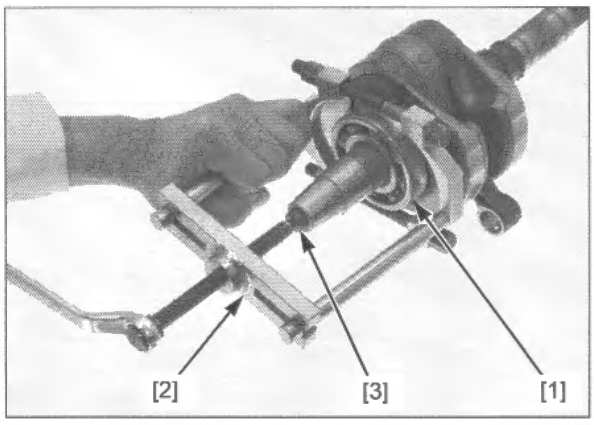
Remove the rear crankshaft bearing [1] using the bearing puller [2] with a suitable protector [3] and discard the bearing.

TOOL:

Bearing Separator Set	**07631-0010000 or equivalent commercially available in U.S.A.**

NOTE:

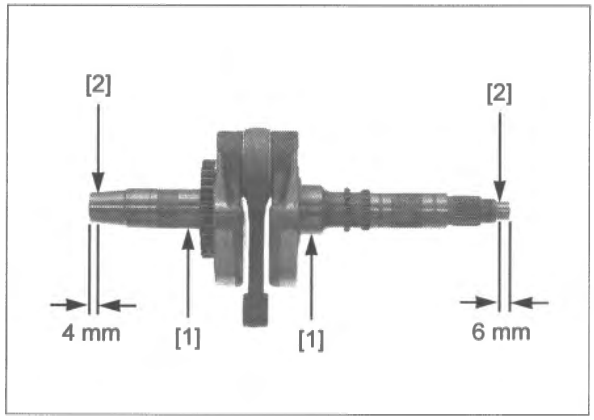
- Always replace the rear crankshaft bearing with a new one when the crankshaft is removed.



INSPECTION

Set the crankshaft in a stand or V-blocks [1] and measure the runout using a dial indicator [2].

SERVICE LIMIT: 0.15 mm (0.006 in)



Inspect the following parts for scratches, damage, abnormal wear and deformation. Replace if necessary.

- balancer drive/driven gears
- crankshaft
- connecting rod
- timing sprocket

Measure each part according to CRANKCASE/TRANSMISSION/CRANKSHAFT/BALANCER SPECIFICATIONS (page 1-14).
Replace any part if it is out of service limit.

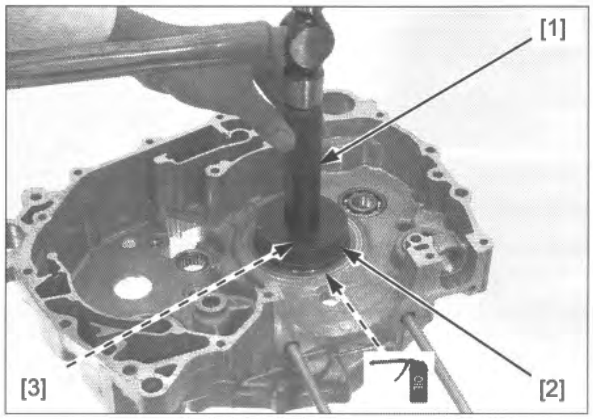
INSTALLATION

Apply engine oil to a new rear crankshaft bearing.
Drive the crankshaft bearing into the rear crankcase with the marking side facing up.

TOOLS:

[1] Driver	**07749-0010000**
[2] Attachment, 72 x 75 mm	**07746-0010600**
[3] Pilot, 32 mm	**07MAD-PR90200**

Other bearing replacement in the crankcase halves (page 16-15).



Install the special tool [1] onto the rear crankshaft end.

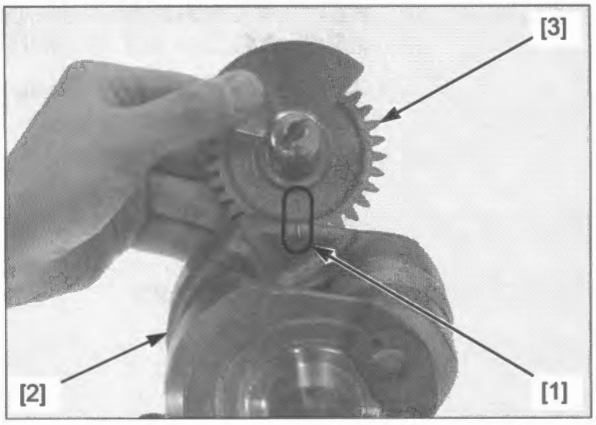
TOOL:

Threaded Adaptor 12 x 1.25	**07965-VM00300 or 07931-KF00200 (U.S.A. only)**



Be careful not to disengage the gears.

Engage the balancer and crankshaft by aligning the index lines [1] on the crank weight [2] and balancer driven gear [3], and install them together into the rear crankcase.

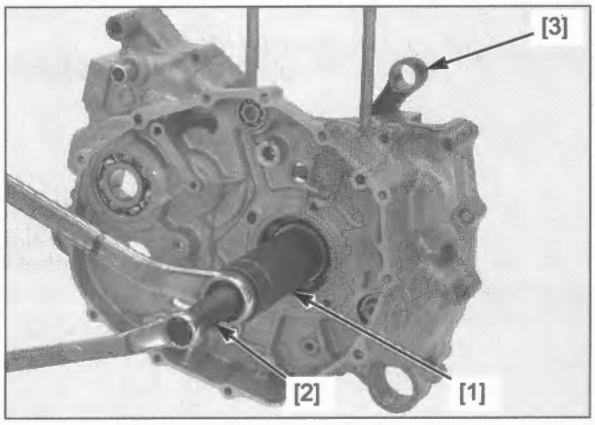


Take care that the crankshaft and balancer do not fall out of the crankcase when installing the special tools.

Install the special tools onto the crankshaft and crankshaft bearing.

TOOLS:

[1] Collar 30.1 x 40/37 x 42.7 07965-VM00100
[2] Threaded Shaft 12 x 1.25 x 80L 07965-VM00200 or 07931-ME4010B and 07931-HB3020A (U.S.A. only)

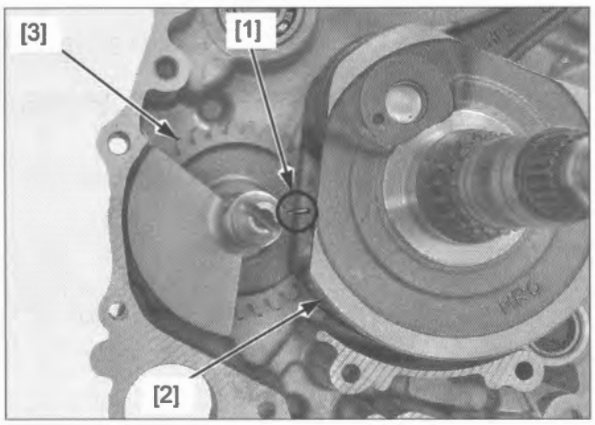


Be careful not to let the connecting rod [3] press against the crankcase mating surface.

Draw the crankshaft into the bearing inner race.

After installing the crankshaft, make sure the index lines [1] on the crank weight [2] and balancer driven gear [3] are aligned.

Install the transmission (page 16-8).
Assemble the crankcase halves (page 16-20).



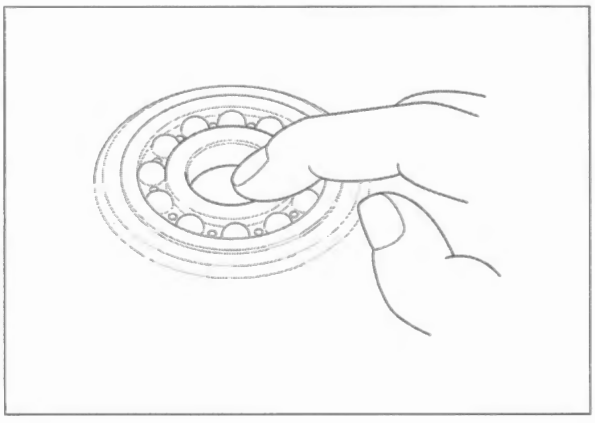
CRANKCASE BEARING

INSPECTION

Remove the crankshaft and balancer (page 16-13).

Turn the inner race of each crankcase bearing with your finger. The bearing should turn smoothly and quietly. Also check that the bearing outer race fits tightly in the crankcase.

Replace any bearing if the inner race does not turn smoothly, quietly or if the outer race fits loosely in the crankcase.



FRONT CRANKCASE BEARING REPLACEMENT (FM/FE models)

Remove the balancer bearing [1] and countershaft bearing [2] with the special tools.

Countershaft bearing:

TOOLS:

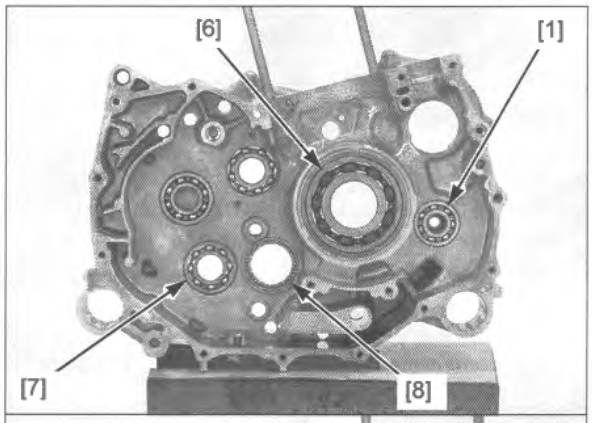
[3] Remover Handle	**07936-3710100**
[4] Bearing Remover, 20 mm	**07936-3710600**
[5] Remover Weight	**07741-0010201 or 07936-371020A (U.S.A. only)**

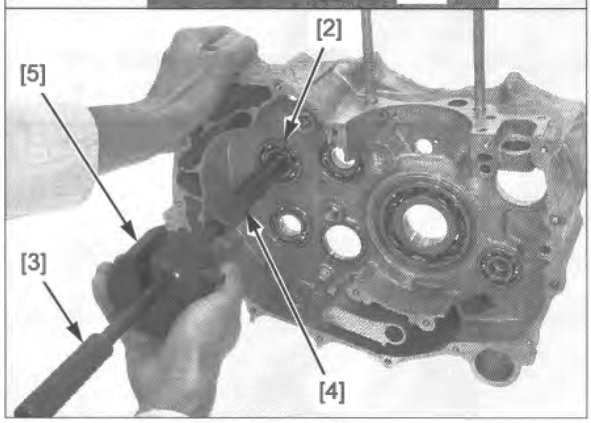
Balancer bearing:

TOOLS:

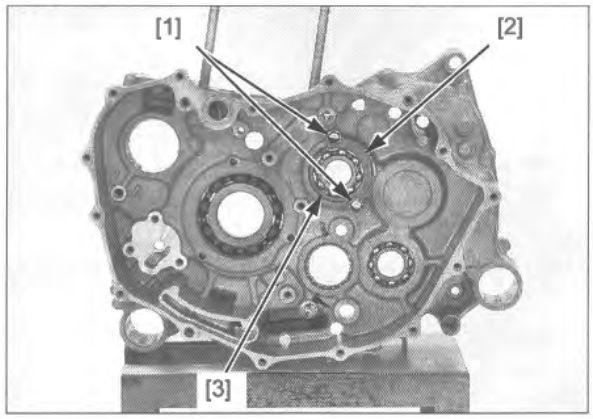
Remover Handle	**07936-3710100**
Bearing Remover Shaft Set, 17 mm	**07936-3710300**
Remover Weight	**07741-0010201 or 07936-371020A (U.S.A. only)**

Drive the crankshaft bearing [6], output shaft bearing [7] and shift drum bearing [8] out of the front crankcase.



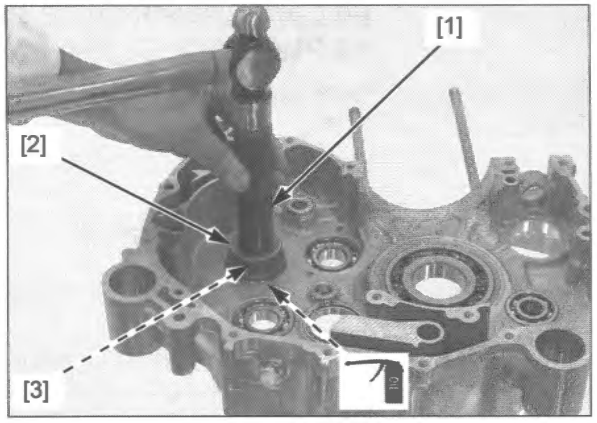


Remove the two bolts [1] and mainshaft bearing setting plate [2].
Drive the mainshaft bearing [3] out of the front crankcase.



Apply engine oil to new bearings.

Drive the bearings in with the marked side facing up.



Crankshaft bearing:

TOOLS:	
[1] Driver	07749-0010000
[2] Attachment, 78 x 90 mm	07GAD-SD40101
[3] Pilot, 40 mm	07746-0040900

Balancer bearing:

TOOLS:	
[1] Driver	07749-0010000
[2] Attachment, 37 x 40 mm	07746-0010200
[3] Pilot, 17 mm	07746-0040400

Mainshaft bearing:

TOOLS:	
[1] Driver	07749-0010000
[2] Driver Attachment, Bearing	07946-6920100
[3] Pilot, 22 mm	07746-0041000

Countershaft bearing:

TOOLS:	
[1] Driver	07749-0010000
[2] Attachment, 42 x 47 mm	07746-0010300
[3] Pilot, 20 mm	07746-0040500

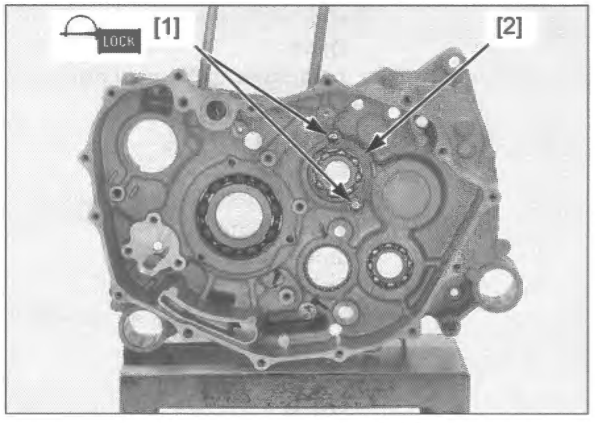
Output shaft bearing:

TOOLS:	
[1] Driver	07749-0010000
[2] Attachment, 42 x 47 mm	07746-0010300
[3] Pilot, 22 mm	07746-0041000

Shift drum bearing:

TOOLS:	
[1] Driver	07749-0010000
[2] Attachment, 42 x 47 mm	07746-0010300
[3] Pilot, 35 mm	07746-0040800

Apply locking agent to the threads of the setting plate bolts [1] (page 1-27).
Install the mainshaft setting plate [2] and tighten the bolts securely.

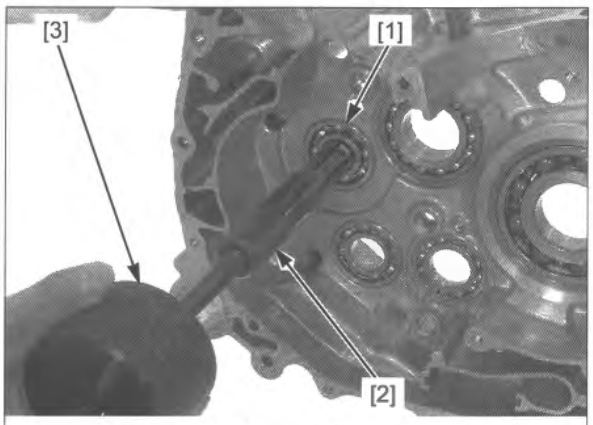


FRONT CRANKCASE BEARING REPLACEMENT (FA models)

Remove the countershaft bearing [1] with the special tools.

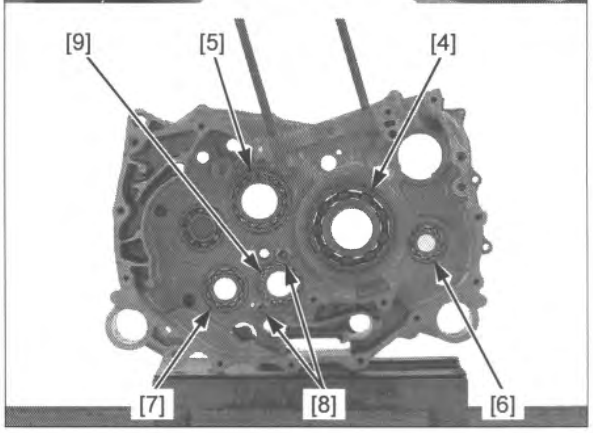
TOOLS:

Remover handle	**07936-3710100**
Remover shaft, 20 mm [2]	**07936-3710600**
Remover weight [3]	**07741-0010201 or 07936-371020A (U.S.A. only)**



Drive the crankshaft bearing [4], mainshaft bearing [5], balancer bearing [6] and output shaft bearing [7] out of the front crankcase.

Remove the two setting bolts [8] and drive the shift drum bearing [9] out of the front crankcase.

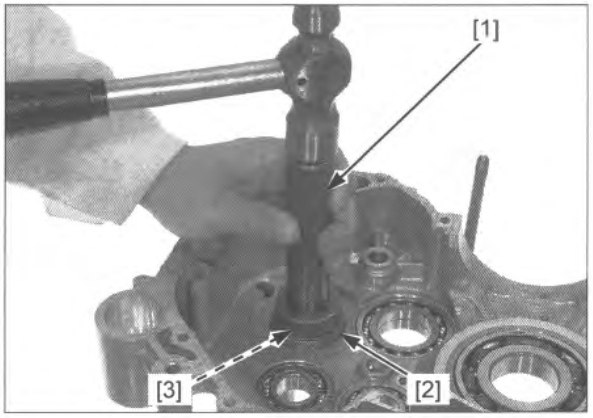


Apply engine oil to new bearings.

Drive the bearings in with the marked side facing up.

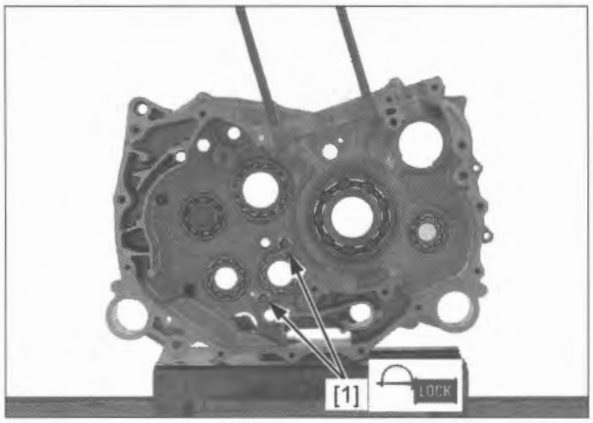
TOOLS:

Crankshaft bearing:	
Driver	**07749-0010000**
Attachment, 78 x 90 mm	**07GAD-SD40101**
Pilot, 40 mm	**07746-0040900**
Balancer bearing:	
Driver	**07749-0010000**
Attachment, 37 x 40 mm	**07746-0010200**
Pilot, 17 mm	**07746-0040400**
Mainshaft bearing:	
Driver	**07749-0010000**
Attachment, 62 x 68 mm	**07746-0010500**
Pilot, 35 mm	**07746-0040800**
Countershaft bearing:	
Driver [1]	**07749-0010000**
Attachment, 42 x 47 mm [2]	**07746-0010300**
Pilot, 20 mm [3]	**07746-0040500**
Output shaft bearing:	
Driver	**07749-0010000**
Attachment, 42 x 47 mm	**07746-0010300**
Pilot, 22 mm	**07746-0040100**
Shift drum bearing:	
Driver	**07749-0010000**
Attachment, 42 x 47 mm	**07746-0010300**
Pilot, 25 mm	**07746-0040600**



Apply locking agent to the shift drum bearing setting bolt [1] threads (page 1-21).
Install the setting bolts and tighten them to the specified torque.

TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)



REAR CRANKCASE BEARING REPLACEMENT

Remove the mainshaft bearing/plate [1] and camshaft bearing [2] with the special tools.

Mainshaft bearing:

TOOLS:

[3] Bearing Remover Shaft Set, 17 mm	**07936-3710300**
[4] Remover Handle	**07936-3710100**
[5] Remover Weight	**07741-0010201 or 07936-371020A (U.S.A. only)**

Camshaft bearing:

TOOLS:

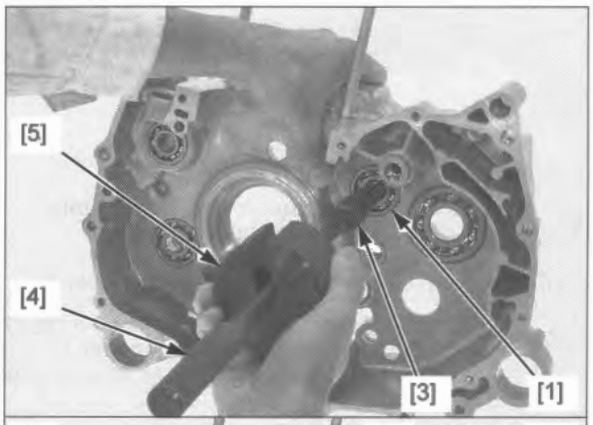
Remover Shaft, 15 mm	**07936-KC10100**
Remover Head, 15 mm	**07936-KC10200**
Remover Weight	**07741-0010201**

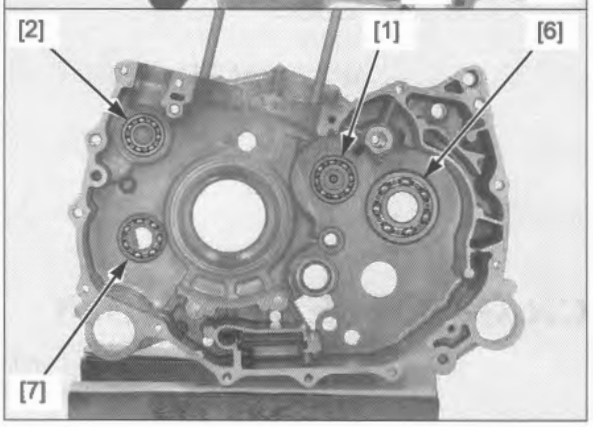
U.S.A. TOOLS:

Bearing remover, 15 mm	**07936-KC10500**
Remover Weight	**07936-371020A**

Drive the countershaft bearing [6] and balancer bearing [7] out of the rear crankcase.

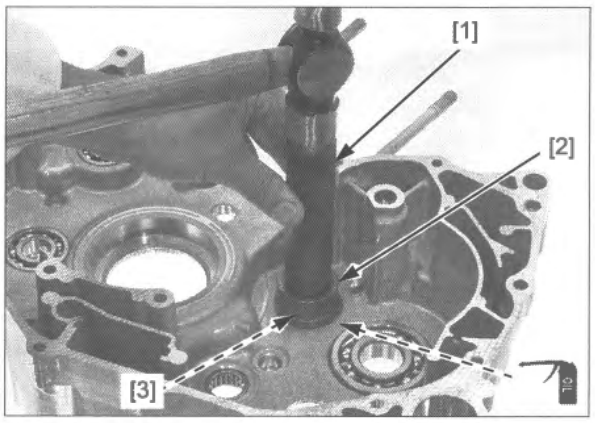
FA models only: Heat the crankcase around the shift drum bearing to 80°C (176°F) and remove the shift drum bearing.





Apply engine oil to new bearings.

Drive the bearings in with the marked side facing up.



Balancer bearing:

TOOLS:

[1] Driver	**07749-0010000**
[2] Attachment, 37 x 40 mm	**07746-0010200**
[3] Pilot, 17 mm	**07746-0040400**

Mainshaft bearing:

TOOLS:

[1] Driver	**07749-0010000**
[2] Attachment, 37 x 40 mm	**07746-0010200**

Countershaft bearing:

TOOLS:

[1] Driver	**07749-0010000**
[2] Attachment, 62 x 68 mm	**07746-0010500**
[3] Pilot, 25 mm	**07746-0040600**

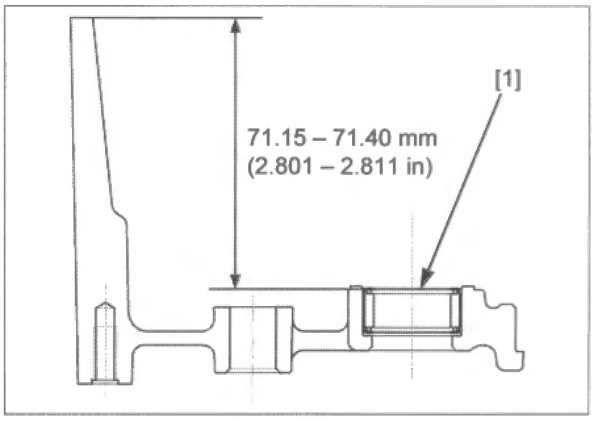
Camshaft bearing:

TOOLS:

[1] Driver	**07749-0010000**
[2] Attachment, 32 x 35 mm	**07746-0010100**
[3] Pilot, 15 mm	**07746-0040300**

FA models only: Freeze the shift drum bearing.

Press the shift drum bearing [1] in with the marking facing up until the depth from the crankcase mating surface is 71.15 – 71.40 mm (2.801 – 2.811 in).



TOOLS:

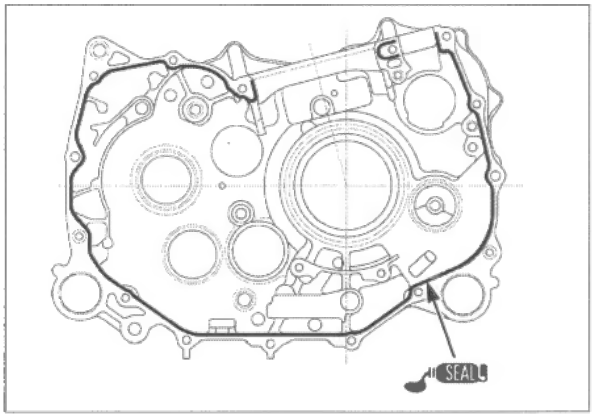
Driver	**07749-0010000**
Attachment, 24 x 26 mm	**07746-0010700**
Pilot, 20 mm	**07746-0040500**

CRANKCASE ASSEMBLY

Clean the front and rear crankcase mating surfaces thoroughly, being careful not to damage them.

Blow through the oil passages in the crankcases with compressed air.

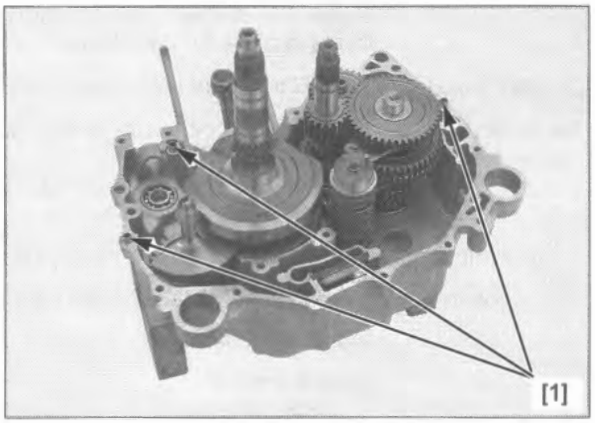
Apply liquid sealant (TB1215 or equivalent) to the mating surface (shadowed area) of the front crankcase as shown.



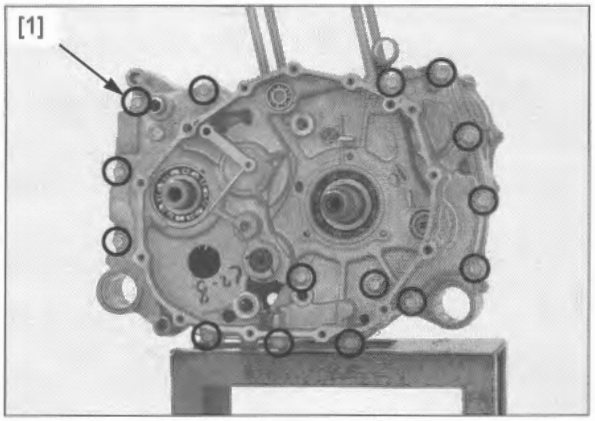
Install the three dowel pins [1] to the rear crankcase.

Make sure all the parts are installed in the rear crankcase.

Install the front crankcase over the rear crankcase.

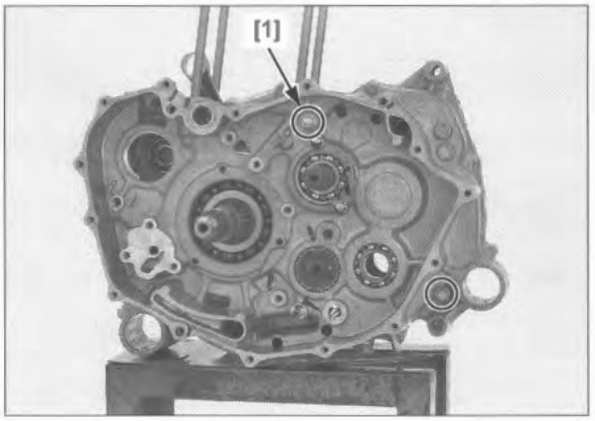


Install the fifteen rear crankcase bolts [1].



Install the two front crankcase bolts [1].

Tighten all the bolts in a crisscross pattern in several steps.



Insert the output shaft [1] into the crankcase until it seats against the bearing in the front crankcase.

FM/FE models: Install the output shaft drive gear [2] and driven gear [3].

FM models (All)/FE models ('14 – '19): Apply engine oil to the journal surfaces of the reverse stopper shaft [4].
Install the reverse stopper shaft/spring assembly into the crankcase as shown.

FE2 (After '19): Install the output shaft drive gear and driven gear.

FA models: Install the output shaft drive gear [2].

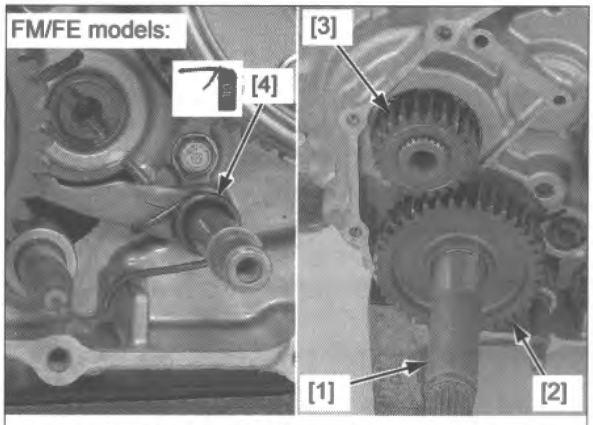
Install the following:

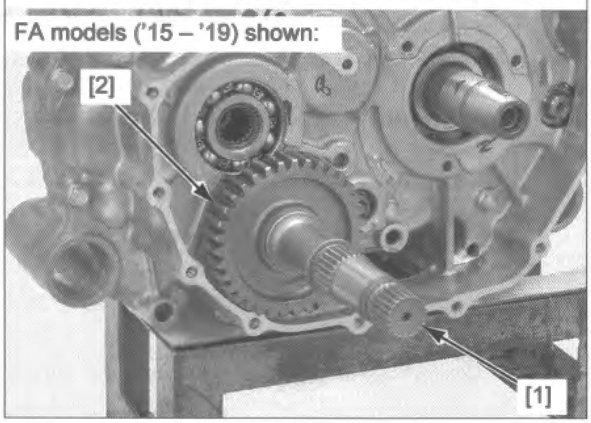
FM/FE models:
- oil pump (page 9-5)
- change clutch (page 12-16)
- gearshift linkage (page 12-19)

FA models:
- reverse stopper shaft/spring assembly (page 13-87) ('15 – '19)
- gearshift linkage (page 13-85)
- dual clutch/primary driven gear (page 13-83)

Install the following:

- flywheel and starter clutch (page 15-21)
- camshaft (page 10-18)
- cylinder and piston (page 11-6)
- cylinder head (page 10-15)
- engine (page 17-12)





17. ENGINE REMOVAL/INSTALLATION

SERVICE INFORMATION 17-2

SYSTEM COMPONENTS 17-2

ENGINE REMOVAL 17-4

ENGINE INSTALLATION 17-12

SERVICE INFORMATION

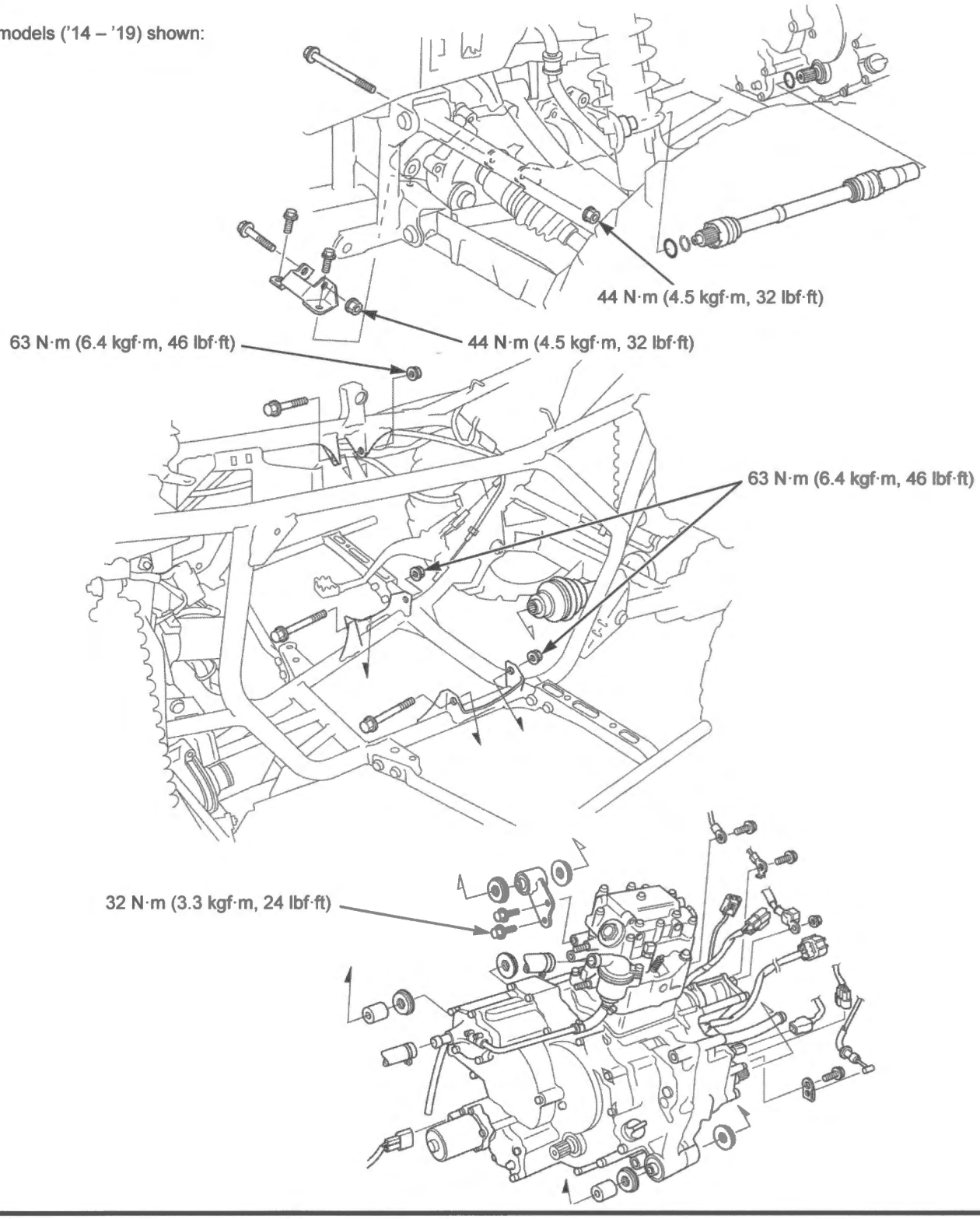
GENERAL

- When removing and installing the engine, tape the frame around the engine beforehand for frame protection.
- The following components require engine removal for service.
  - alternator/starter clutch (page 15-4)
  - crankcase/transmission/crankshaft/balancer (page 16-5)

SYSTEM COMPONENTS

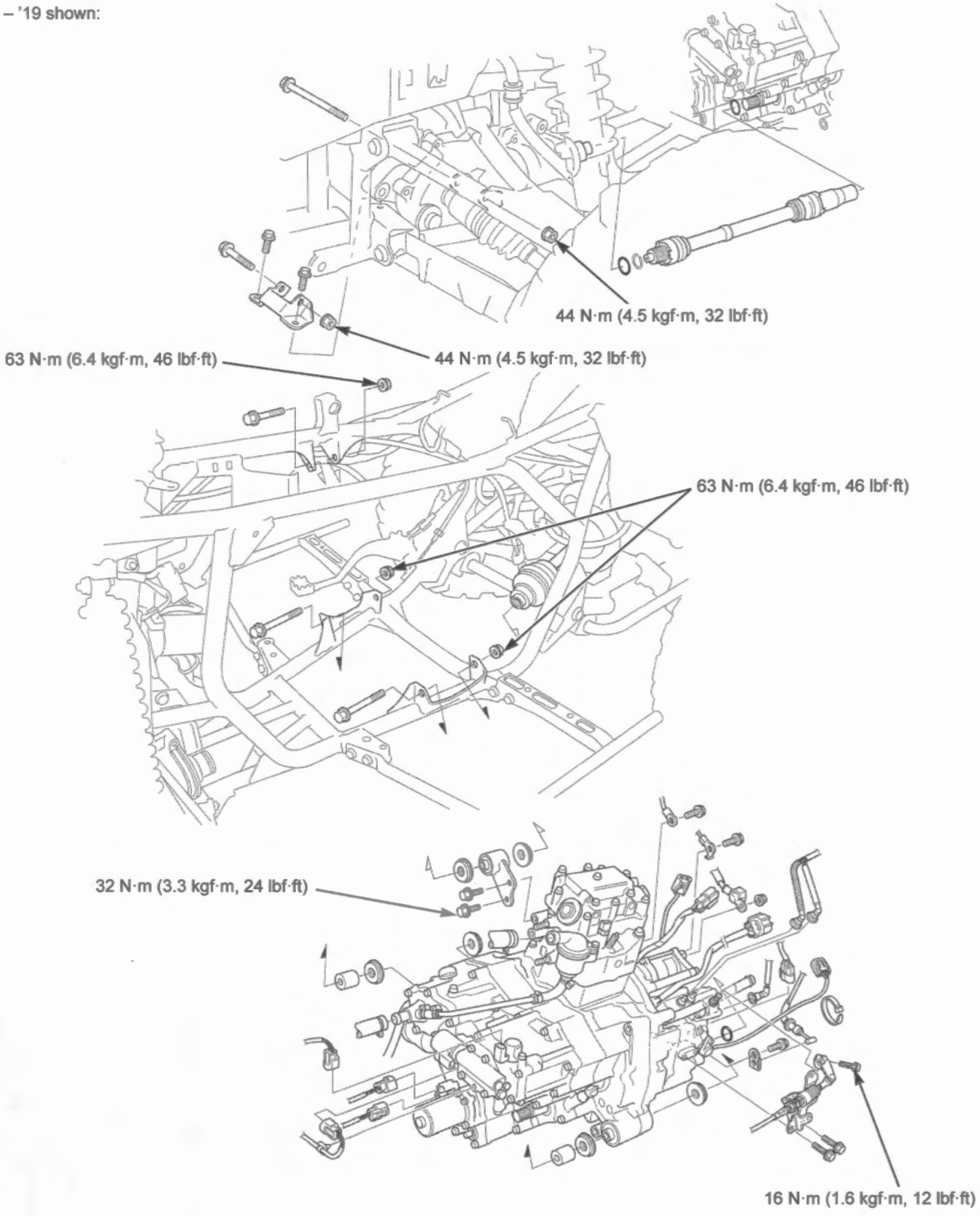
FM/FE models:

FE models ('14 – '19) shown:



FA models:

'15 – '19 shown:



ENGINE REMOVAL

FM/FE models:

Remove the following:

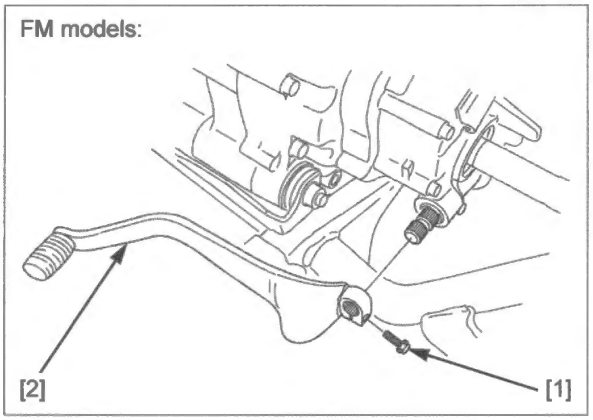
- center mudguards (page 2-5)
- engine guard (page 2-8)

Drain the engine oil (page 3-14).
Drain the coolant (page 8-5).

Remove the following:

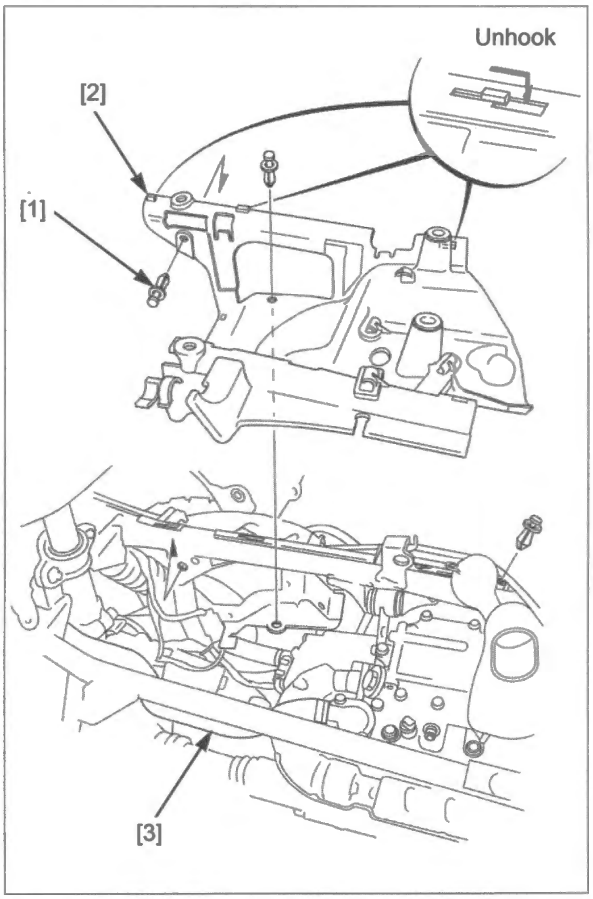
- fuel tank (page 7-18)
- throttle body (page 7-19)
- exhaust system (page 2-16)
- battery (–) cable (page 23-5)

FM models: Remove the pinch bolt [1] and gearshift pedal [2].



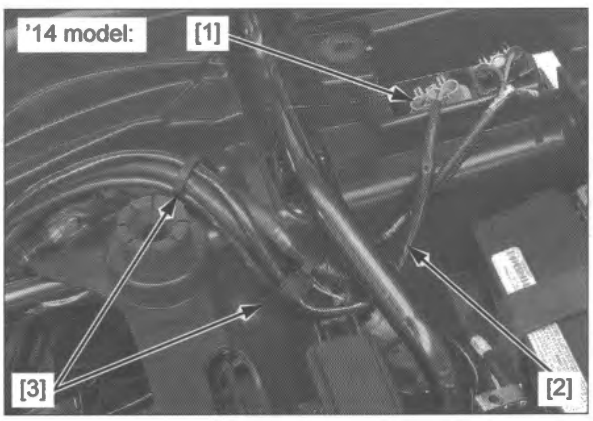
Remove the trim clips [1].

Unhook and remove the heat protector [2] and release the water hose [3].



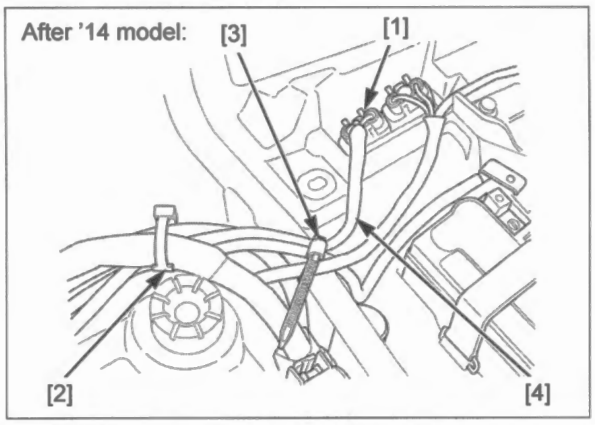
'14 model: Disconnect the stator 3P (Gray) connector [1].

Release the stator wire [2] from the wire clamps [3].



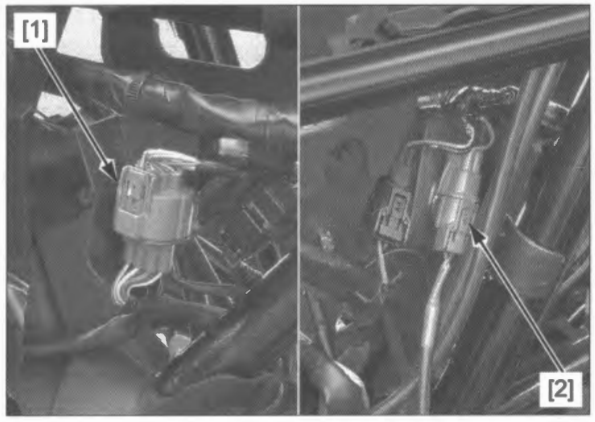
After '14 model: Disconnect the stator 3P (Gray) connector [1].

Unlock the wire clamp [2], remove the wire band [3] and release the stator wire [4].



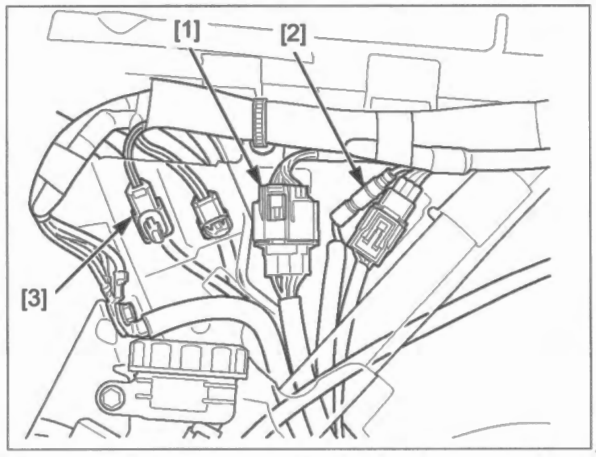
'14 – '19: Disconnect the following:

- gear position switch 8P (Gray) connector [1]
- CKP sensor 2P (Gray) connector [2]



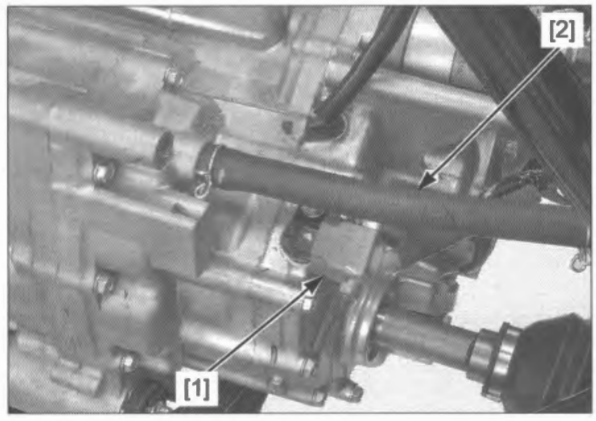
After '19: Disconnect the following:

- sensor harness 8P (Black) connector [1]
- neutral switch wire connector [2]
- CKP sensor 2P (Gray) connector [3]



Disconnect the following:

- VS sensor 3P (Black) connector [1]
- crankcase breather hose [2]



Loosen the adjuster of the reverse selector cable (page 3-28).

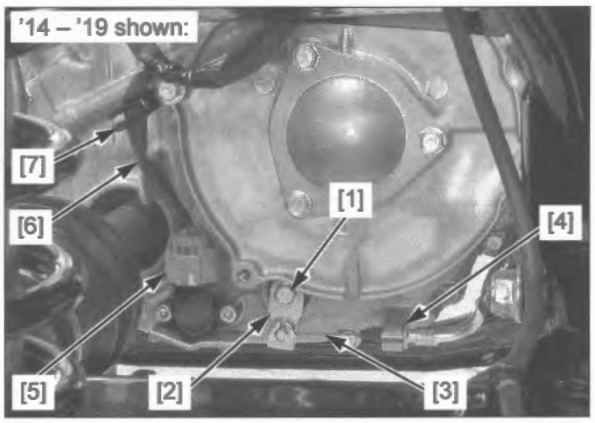
FM models (All)/FE models ('14 – '19):

Remove the following:

- bolt [1] and selector arm [2] (to disconnect the selector cable)
- selector cable [3] (from the cable holder [4] of the engine)

'14 – '19:

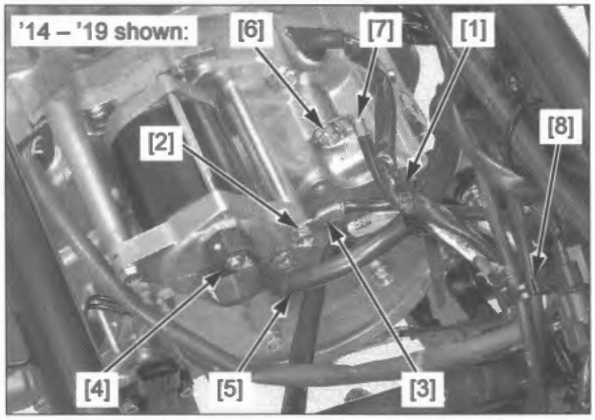
Disconnect the shift spindle angle sensor 3P (Gray) connector [5] and release its wire [6] from the wire clamp [7].



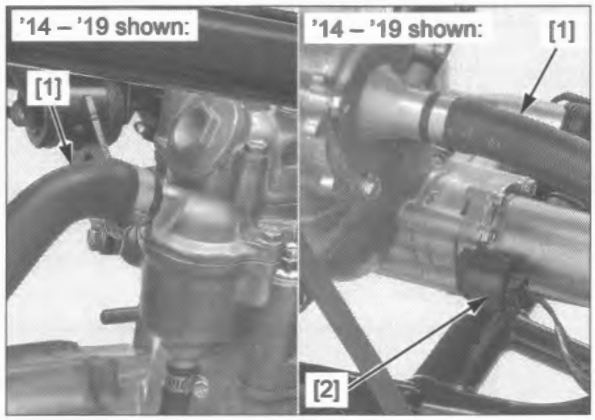
Remove the following:

- wire band [1]
- bolt [2] and ground cable [3]
- nut [4] and starter motor cable [5]
- bolt [6] and battery (–) cable [7]

Release the wires from the wire clamp [8].



Disconnect the water hoses [1] and disconnect the shift control motor 2P (Black) connector [2].



FA models:

Remove the following:

- center mudguards (page 2-5)
- engine guard (page 2-8)

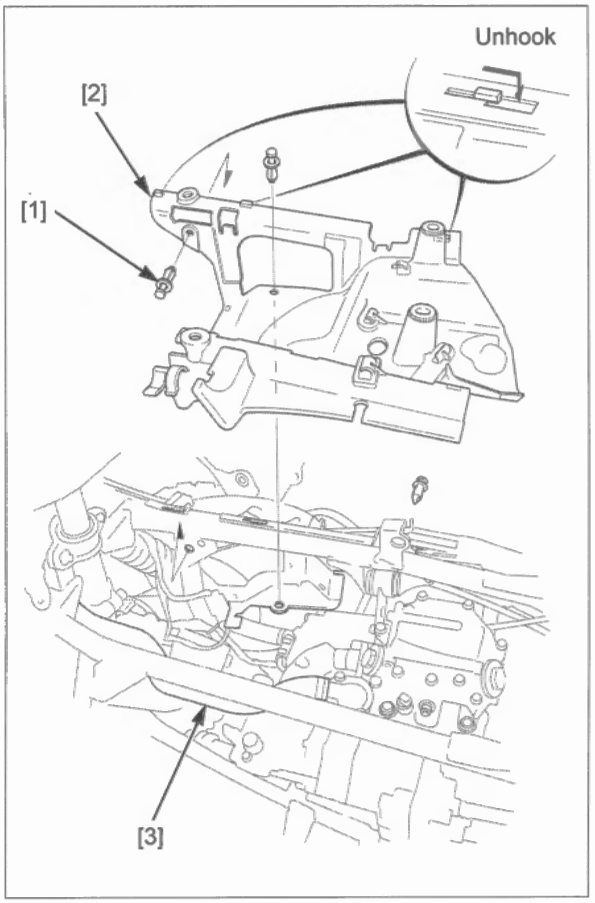
Drain the engine oil (page 3-14).
Drain the coolant (page 8-5).

Remove the following:

- fuel tank (page 7-18)
- throttle body (page 7-19)
- range select cable cover (page 3-22)
- exhaust system (page 2-16)
- battery (–) cable (page 23-5)

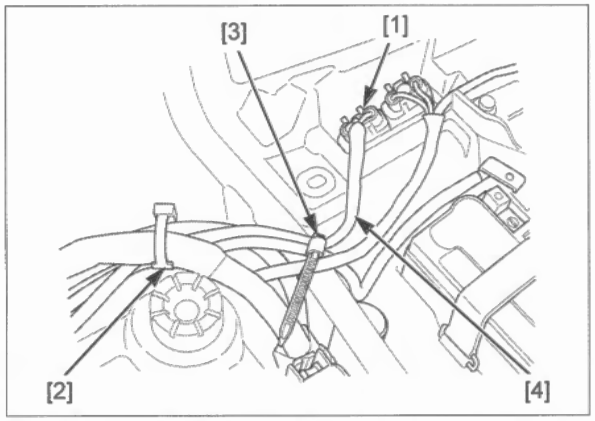
Remove the trim clips [1].

Unhook and remove the heat protector [2] and release the water hose [3].



Disconnect the stator 3P (Gray) connector [1].

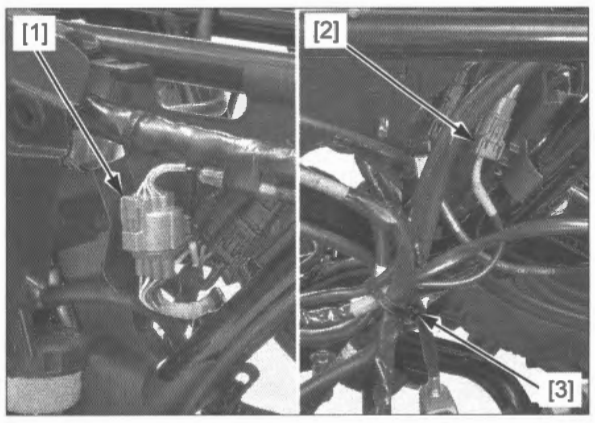
Unlock the wire clamp [2], remove the wire band [3] and release the stator wire [4].



'15 –'19: Disconnect the following:

- shift drum position switch 10P (Gray) connector [1]
- CKP sensor 2P (Gray) connector [2]

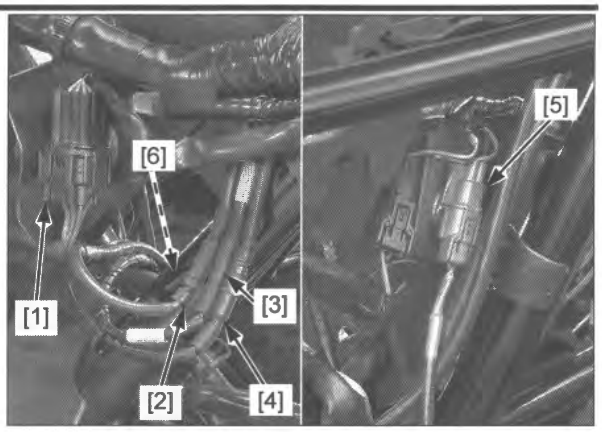
Remove the wire band [3].



After '19: Disconnect the following:

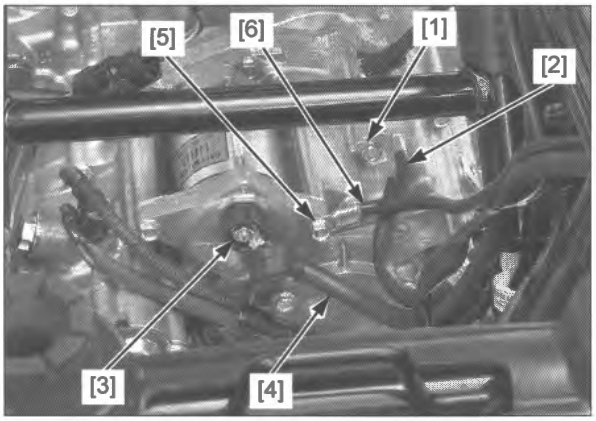
- sensor harness 8P (Black) connector [1]
- neutral switch wire connector [2]
- sub-transmission low switch connector [3]
- sub-transmission drive switch connector [4]
- CKP sensor 2P (Gray) connector [5]

Remove the wire band [6].



Remove the following:

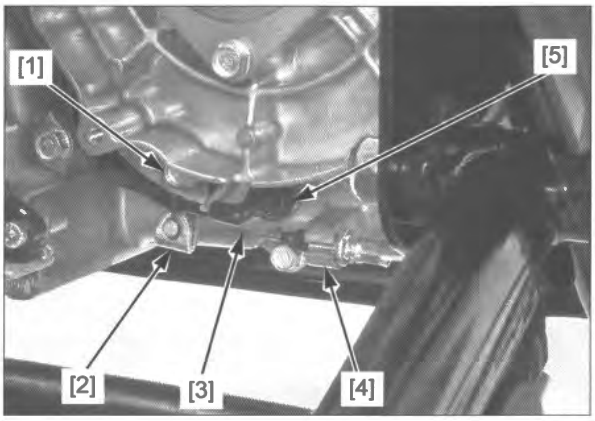
- bolt [1] and ground cable [2]
- nut [3] and starter motor cable [4]
- bolt [5] and battery (–) cable [6]



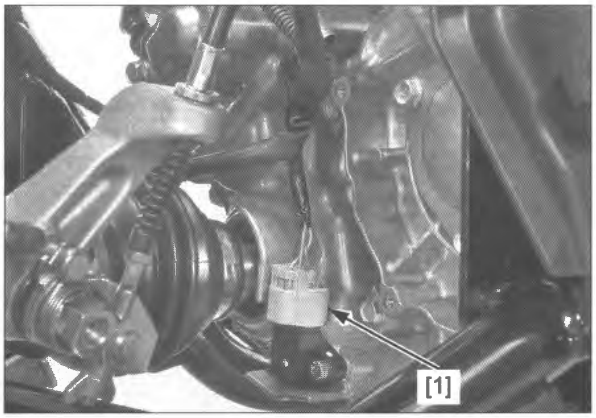
'15 – '19: Remove the following:

- bolt [1] and selector arm [2] (to disconnect the selector cable)
- selector cable [3] (from the cable holder [4] of the engine)

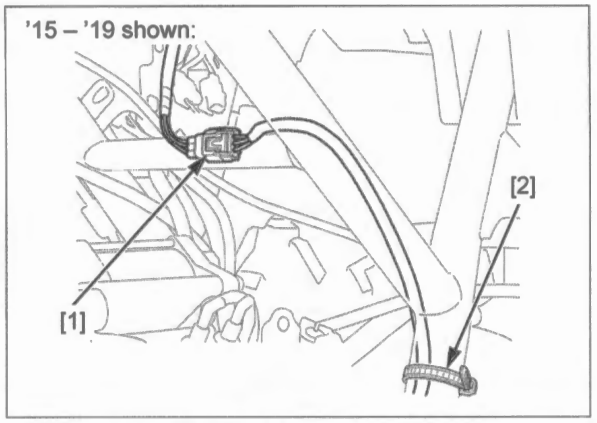
Disconnect the reverse switch terminal [5].



'15 – '19: Disconnect the shift spindle angle sensor 3P (Gray) connector [1].



Disconnect the rear VS sensor 3P (Black) connector [1] and remove the wire band [2].

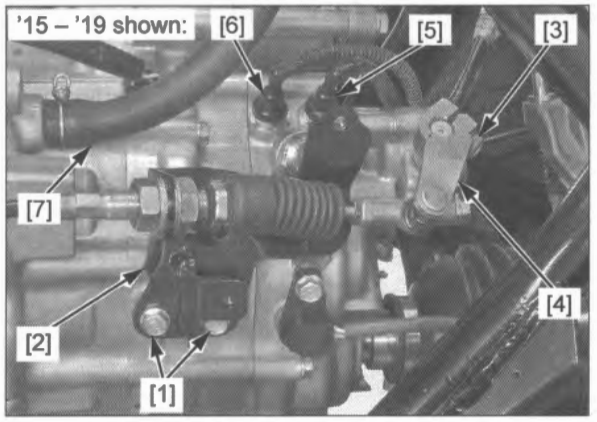


Remove the bolts [1] and range select cable bracket [2].

Remove the pinch bolt [3] and release the shift arm [4].

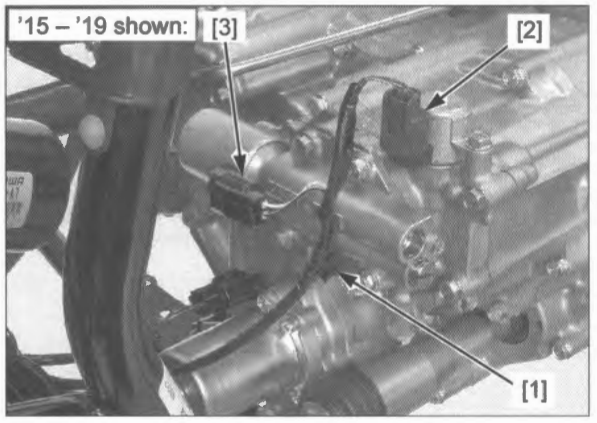
Disconnect the sub-transmission low [5] and drive [6] switch terminals.

Disconnect the crankcase breather hose [7].



Remove the wire clip [1] from the stay.

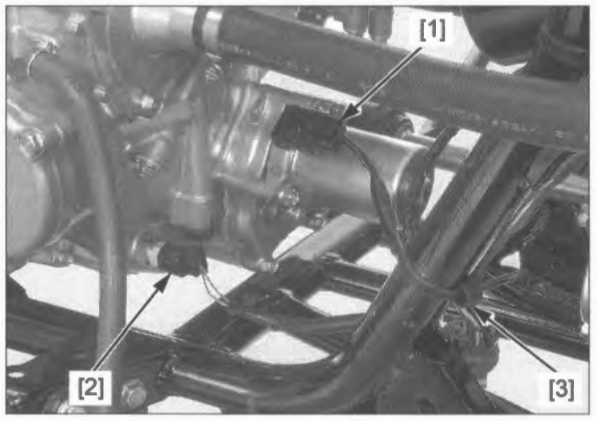
Disconnect the shift solenoid valve 2P connector [2] and dual clutch PC solenoid valve 2P connector [3].



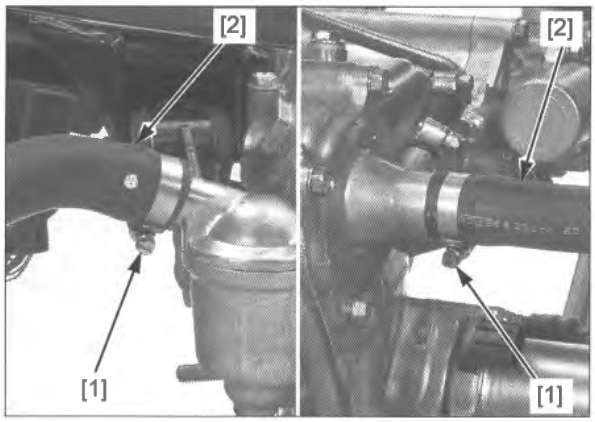
Disconnect the following:

- shift control motor 2P connector [1]
- EOT sensor 2P connector [2]

Remove the wire band [3].



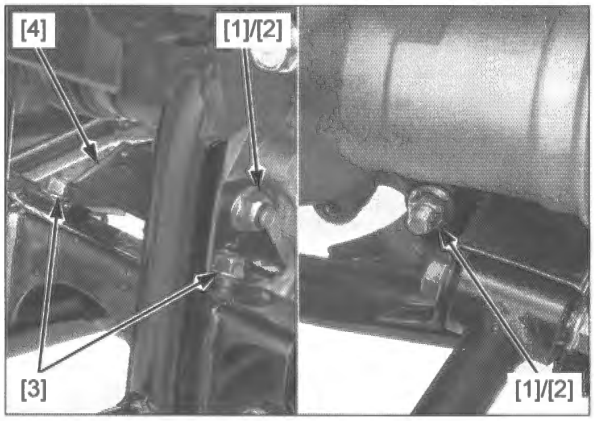
Loosen the band screws [1] and disconnect the water hoses [2].



All models:

Remove the following:

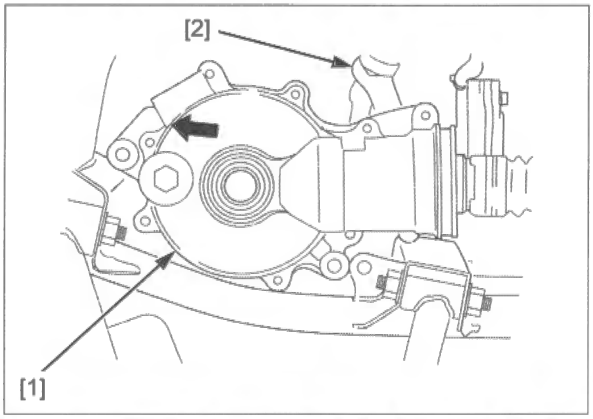
- front final gear case mounting nuts [1] and bolts [2]
- bolts [3] and mounting bracket [4]



Move the gear case assembly [1] forward for maximum clearance between the propeller shaft joint and engine.

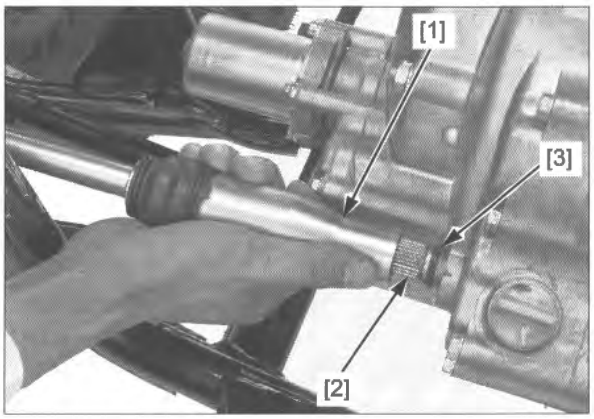
NOTE:

- Turn the handlebar all the way to the right to move the gear case assembly.
- Put some cloth on the gear case to avoid scratching or damaging the tie-rod end [2].



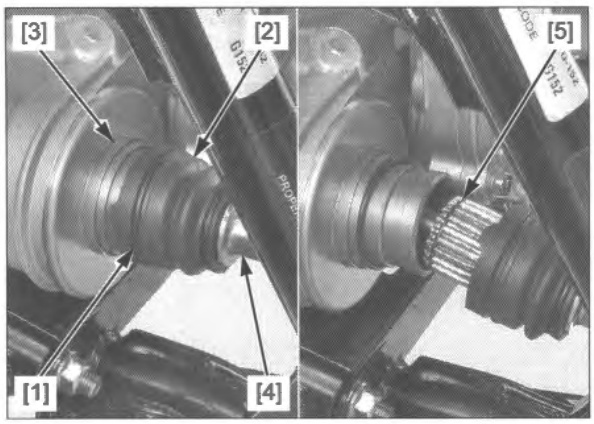
Pull the propeller shaft joint [1] out of the output shaft [2] from the engine.

Remove the O-ring [3] from the output shaft.



Remove the boot band [1] and release the propeller shaft boot [2] off the final clutch joint [3] of the gear case assembly.
Pull the propeller shaft [4] to force the stopper ring [5] past the groove in the final clutch joint to remove the propeller shaft.

Remove the stopper ring from the propeller shaft.



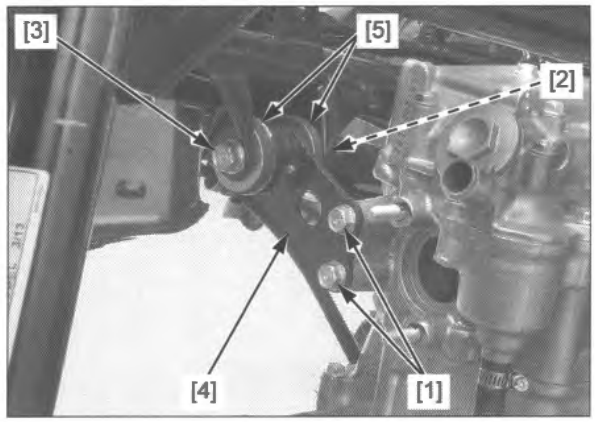
Place a jack or other adjustable support under the engine.

NOTE:

- The jack height must be continually adjusted to relieve stress for ease of bolt removal.

Remove the following from the engine upper mount:

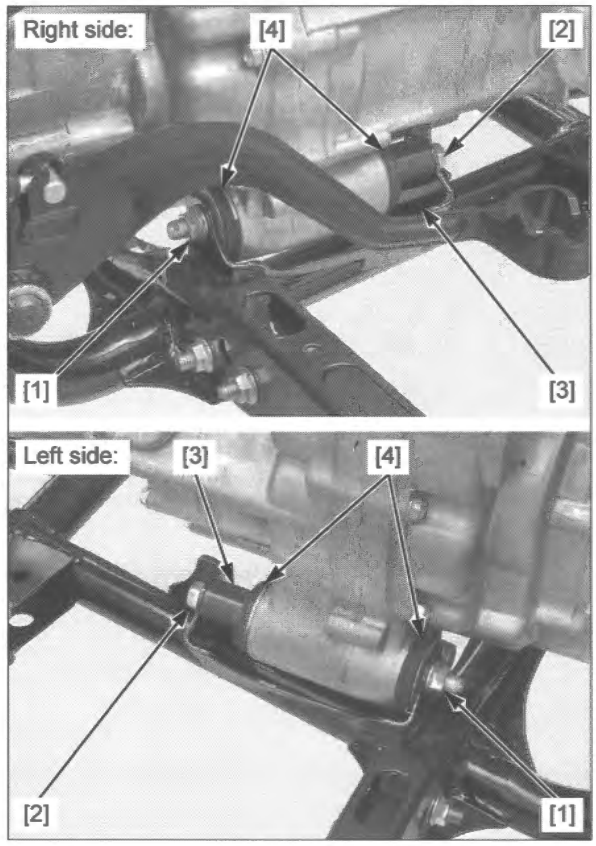
- engine hanger bolts [1] (engine side)
- engine hanger nut [2] and bolt [3] (frame side)
- hanger bracket [4]
- mounting rubbers [5]



Set suitable wooden blocks between the engine and lower frame pipe to support the engine.

Remove the following from each engine lower mount:

- engine hanger nut [1] and bolt [2]
- spacer [3]
- mounting rubbers [4]

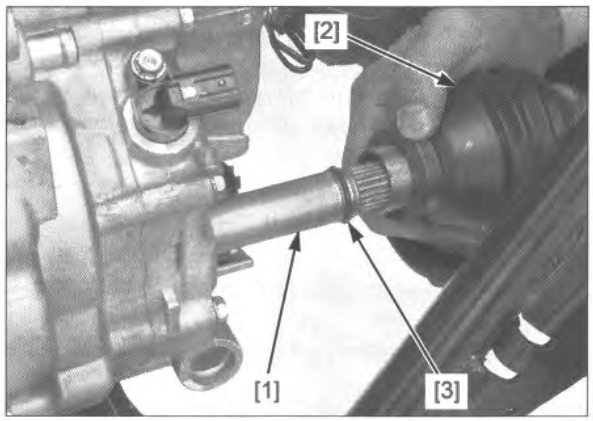


Move the engine forward and disconnect the output shaft [1] from the universal joint [2].

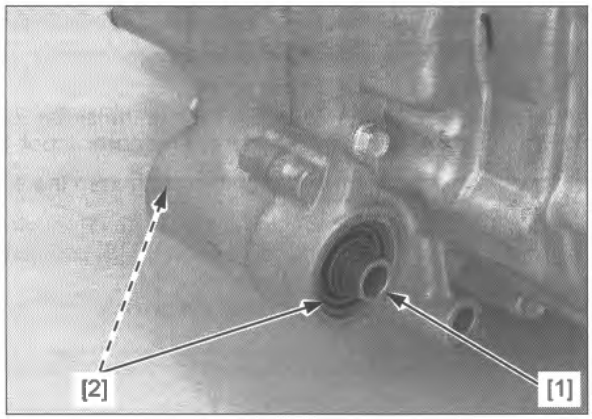
Hold the engine securely and take care not to damage the frame and engine.

Remove the engine out of the frame from the left side.

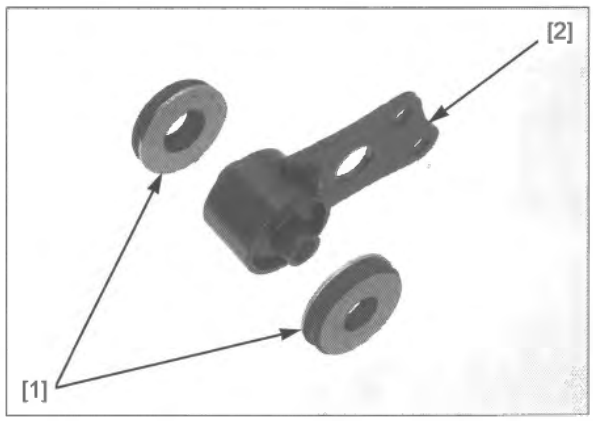
Remove the O-ring [3] from the output shaft.



Remove the engine mounting bushings [1] and dust seals [2].



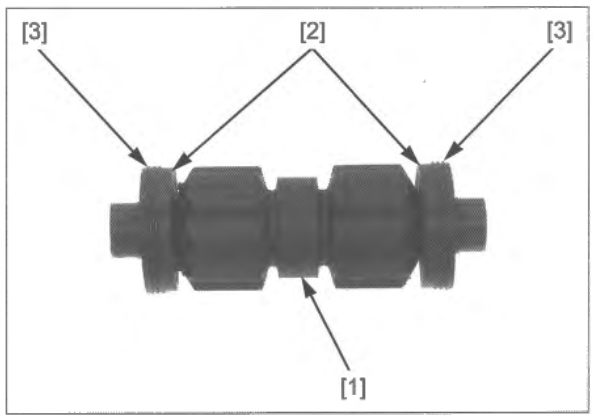
Check the mounting rubbers [1], bushings [2] and dust seals for deterioration, wear or damage.



ENGINE INSTALLATION

Install the lower engine mounting bushings [1] into the engine.

Install the dust seals [2] with the lip side [3] facing out.



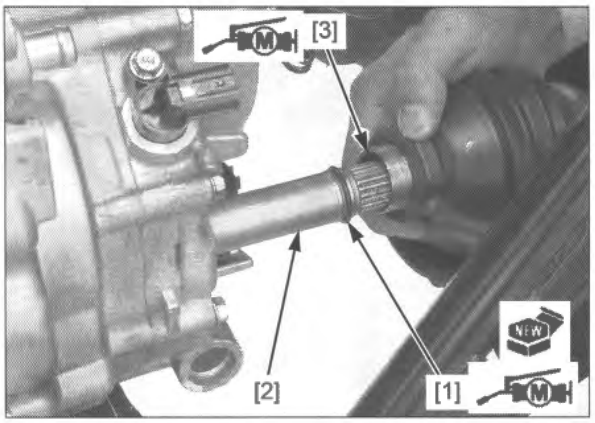
Hold the engine securely and be careful not to damage the frame and engine.

Using a jack or other adjustable support, place the engine in the frame from the left side and support it with suitable wooden blocks.

Coat a new O-ring [1] with molybdenum disulfide grease and install it into the output shaft [2] groove.

Apply molybdenum disulfide grease to the splines of the universal joint [3].

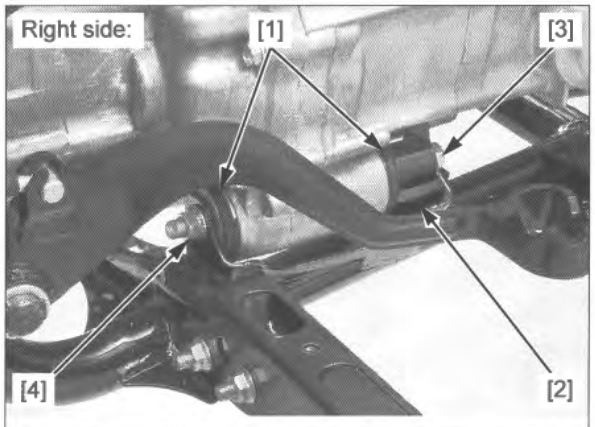
Carefully move the engine and engage the output shaft with the universal joint.

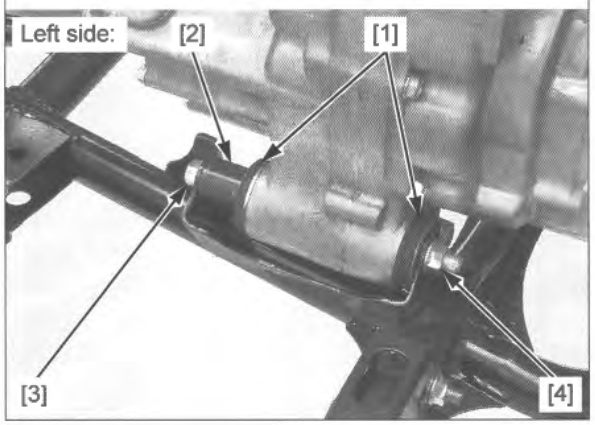


Be sure the universal joint is not disengaged.

Install the mounting rubbers [1] onto the lower mounting bushing with the larger I.D. side facing in.
Install the spacer [2] and the hanger bolt [3] (from the front side) while aligning the bolt holes carefully.
Loosely install the hanger nut [4].

Install the other side mounting fasteners in the same manner as above.





Install the mounting rubbers [1] onto the upper mounting bushing in the hanger bracket [2] with the large I.D. side facing in.
Loosely install the hanger bracket with the 10 mm hanger bolt [3] (from the front side) and nut [4].
Loosely install the 8 mm hanger bolts [5].

After installing and seating all of the mounting fasteners, tighten them to the specified torque in the following order:

– left and right lower engine hanger nuts

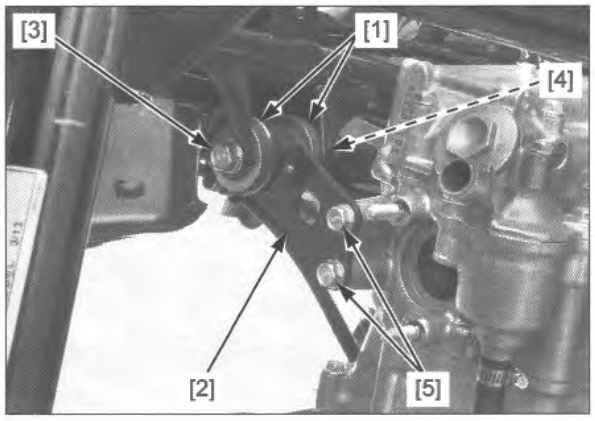
TORQUE: 63 N·m (6.4 kgf·m, 46 lbf·ft)

– engine side upper engine hanger bolts

TORQUE: 32 N·m (3.3 kgf·m, 24 lbf·ft)

– frame side upper engine hanger nut

TORQUE: 63 N·m (6.4 kgf·m, 46 lbf·ft)

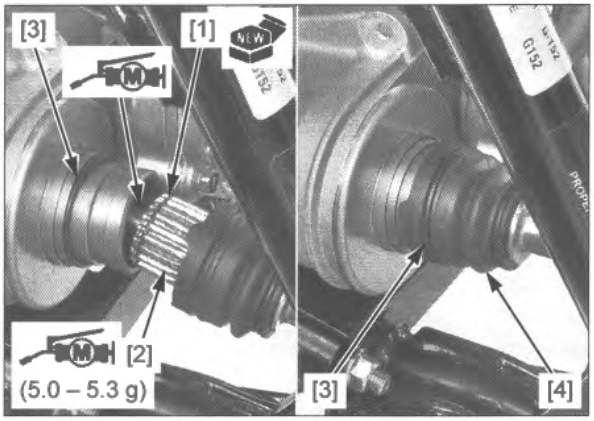


Install a new stopper ring [1] into the groove in the propeller shaft [2] end.

Apply 5.0 – 5.3 g (0.18 – 0.19 oz) of molybdenum disulfide grease to the splines of the propeller shaft.
Apply molybdenum disulfide grease to the front end of the propeller shaft.
Place the boot band [3] over the final clutch joint temporarily.

Install the propeller shaft into the final clutch joint, aligning the splines until the stopper ring seats in the groove.
Make sure the stopper ring is seated properly by pulling the propeller shaft lightly.

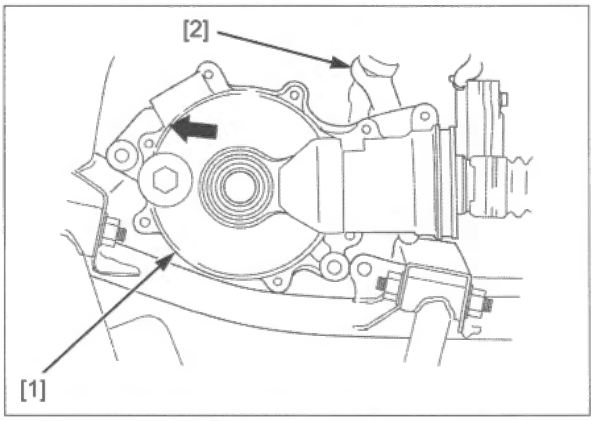
Install the boot [4] over the final clutch joint groove securely and the boot band into the boot groove.



Move the gear case assembly [1] forward for maximum clearance between the shaft joint and output shaft.

NOTE:

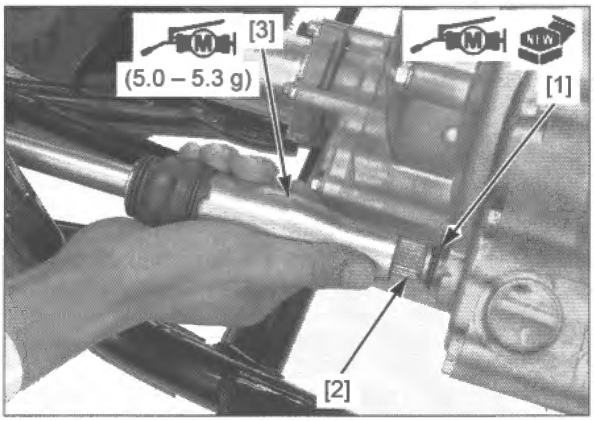
- Turn the handlebar all the way to the right to move the gear case assembly.
- Put some cloth on the gear case to avoid scratching or damaging the tie-rod end [2].



Coat a new O-ring [1] with molybdenum disulfide grease and install it into the output shaft [2] groove.

Apply 5.0 – 5.3 g (0.18 – 0.19 oz) of molybdenum disulfide grease to the splines of the propeller shaft joint [3].

Engage the shaft joint over the output shaft and move the gear case assembly rearward.



Align the rear mounting bolt holes in the gear case [1] and frame, then loosely install the mounting bolt [2] from the right side and a new mounting nut [3].

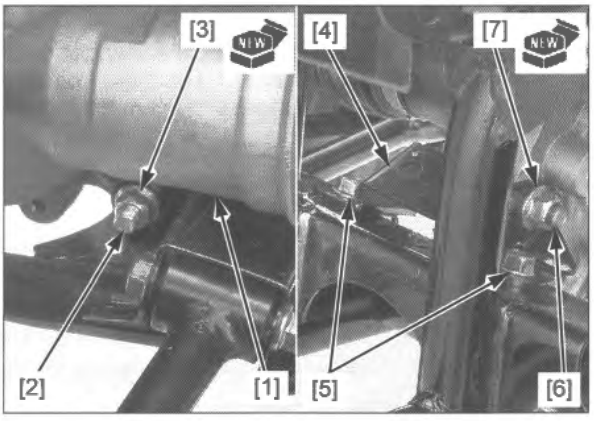
Loosely install the mounting bracket [4] with the bolts [5].
Loosely install the front mounting bolt [6] from the right side and a new mounting nut [7].

Tighten all the gear case mounting fasteners in the following sequence.

– Rear mounting nut
– Mounting bracket bolts
– Front mounting nut

TORQUE:

Rear mounting nut: 44 N·m (4.5 kgf·m, 32 lbf·ft)
Front mounting nut: 44 N·m (4.5 kgf·m, 32 lbf·ft)



Install the removed parts in the reverse order of removal.

TORQUE:
Shift arm pinch bolt 16 N·m (1.6 kgf·m, 12 lbf·ft)
(FA models):

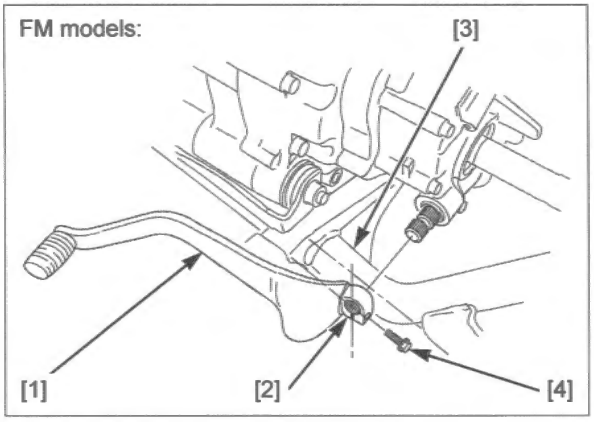
- Route the wires, cables and hoses properly (page 1-31).
- Tighten the hose clamp screw securely (page 8-8).

FM models: Install the gearshift pedal [1] so that the bottom surface of the pedal joint [2] is parallel with the frame pipe [3]. Install the pinch bolt [4] and tighten it to the specified torque.

TORQUE: 20 N·m (2.0 kgf·m, 15 lbf·ft)

Adjust the reverse selector cable (page 3-28).
Fill the engine with recommended oil (page 3-14).
Fill and bleed the cooling system (page 8-5).
Check the engine oil level (page 3-13).

FM models:



MEMO

18. FRONT WHEEL/SUSPENSION/STEERING

SERVICE INFORMATION 18-2

TROUBLESHOOTING 18-3

SYSTEM COMPONENTS 18-4

HANDLEBAR 18-6

THROTTLE HOUSING 18-9

FRONT WHEEL 18-11

TIRES 18-11

FRONT WHEEL HUB/KNUCKLE 18-14

SUSPENSION ARM 18-21

FRONT SHOCK ABSORBER 18-24

STEERING SHAFT (FM1/FE1/FM5/FA5) 18-25

STEERING SHAFT/EPS UNIT (FM2/FM6/FM7/FE2/FA6/FA7) 18-28

TIE-ROD 18-33

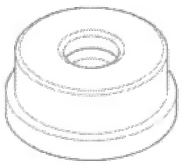
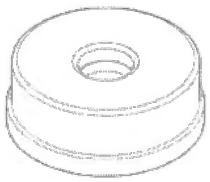
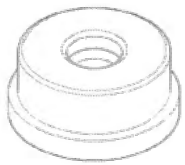
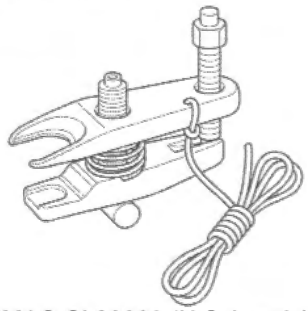
SERVICE INFORMATION

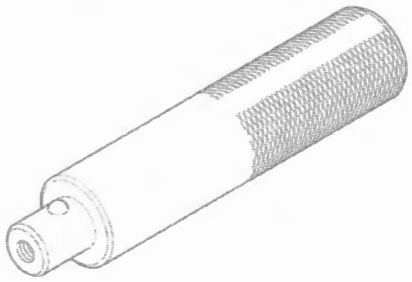
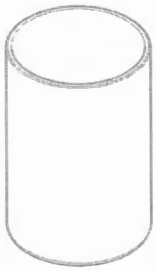
GENERAL

- This section covers service of the front wheel, suspension and steering (including EPS unit; FM2/FM6/FM7/FE2/FA6/FA7). For electrical system service of the EPS, see Electric Power Steering (EPS) section (page 26-3).
- A contaminated brake disc or pad reduces stopping power. Discard contaminated pads and clean a contaminated disc with a high quality brake degreasing agent.
- A jack or other support is required to support the vehicle.
- Adjust toe whenever the tie-rod, knuckle or steering shaft are replaced or removed (page 3-31).
- Do not twist or bend the brake hose when servicing.
- Use Honda Genuine replacement bolts and nuts for all suspension pivots and mounting points.
- For brake system service, see Brake System section (page 20-4).
- For driving mechanism service, see Front Wheel Mechanism section (page 21-2).
- For each switch inspection, see Lights/Meters/Switches section.
  - left handlebar switch (page 24-15)
  - right handlebar switch (page 21-23)
  - front brake inhibitor switch (page 24-15)
  - rear brake light switch (page 24-16)
- FM2/FM6/FM7/FE2/FA6/FA7 only: Perform the torque sensor initialization when you service the following components (page 26-9)

Service Location	Replacement	Removal/Installation
Cables and harness around handlebar	INITIALIZE	INITIALIZE
Handlebar	INITIALIZE	INITIALIZE
Steering shaft and steering shaft bushing	INITIALIZE	INITIALIZE
Steering arm and nut	INITIALIZE	INITIALIZE
EPS unit	INITIALIZE	INITIALIZE
EPS ECU	INITIALIZE	NO NEED

TOOLS

Attachment, 42 x 47 mm 07746-0010300 	Attachment, 52 x 55 mm 07746-0010400 	Attachment, 40 x 42 mm 07746-0010900 
Driver, Inner 20 mm 07746-0020400 	Pilot, 20 mm 07746-0040500 	REMOVER, BALL JOIN 07MAC-SL00201  or 07MAC-SL00202 (U.S.A. only)

Driver 07749-0010000	Attachment, 28 x 30 07946-1870100	Remover/Installer 42.5 x 43 mm 07WMF-HN00100
		

TROUBLESHOOTING

Hard steering
- Steering shaft holder too tight
- Damaged steering shaft bearing/bushing
- Insufficient tire pressure
- Faulty EPS (FM2/FM6/FM7/FE2/FA6/FA7) (page 26-5)

Steers one side or does not track straight
- Incorrect wheel alignment
- Unequal tire pressure
- Bent tie-rod, suspension arm or frame
- Worn or damaged knuckle bearing
- Weak shock absorber

Front wheel wobbling
- Bent rim
- Worn or damaged knuckle bearing
- Faulty tire
- Loose wheel hub nut

Soft suspension
- Weak shock absorber spring
- Oil leakage from damper unit

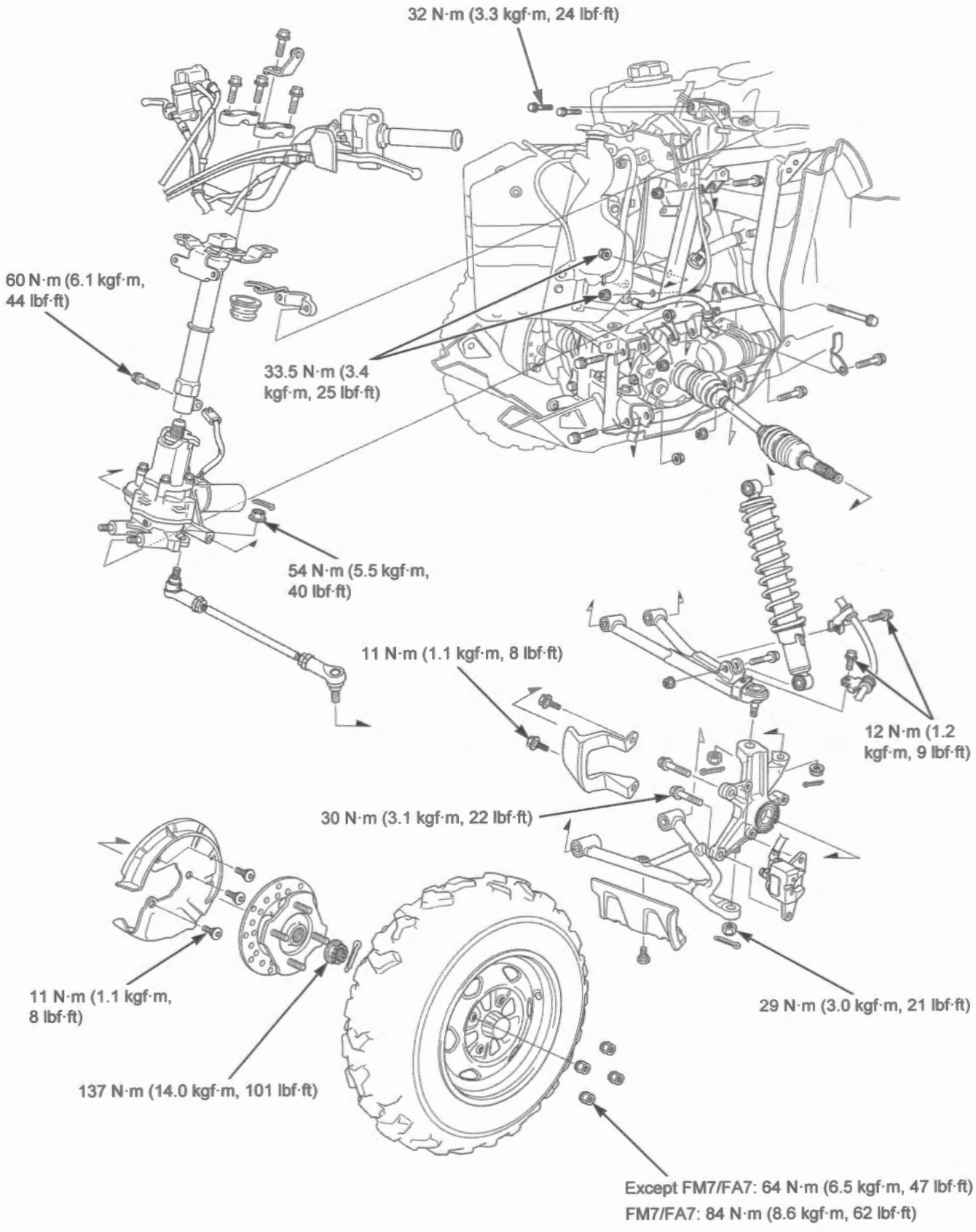
Stiff suspension
- Damaged shock absorber damper
- Faulty shock absorber pivot bushings
- Improperly installed suspension arms
- Faulty suspension arm bushings

Front suspension noise
- Faulty front shock absorber
- Loose front suspension fasteners
- Worn front suspension pivot bushings
- Damaged suspension components

SYSTEM COMPONENTS

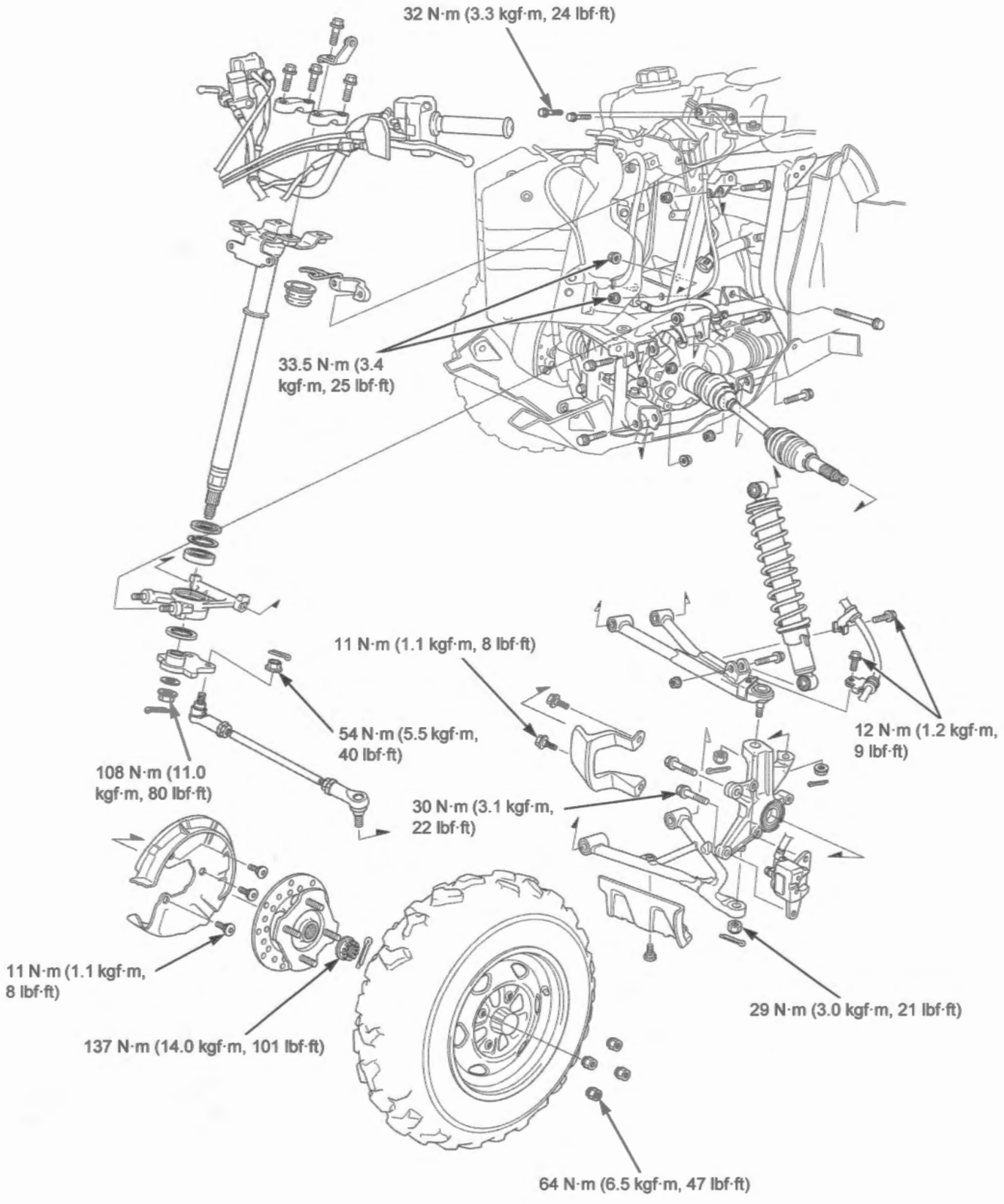
FM2/FM6/FM7/FE2/FA6/FA7:

'14 – '19 shown:



FM1/FE1/FM5/FA5:

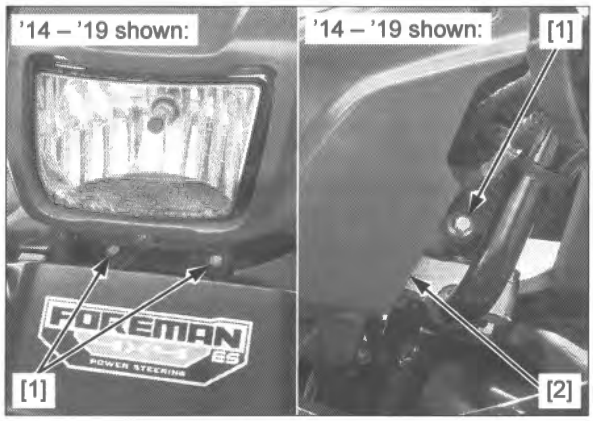
'14 – '19 shown:



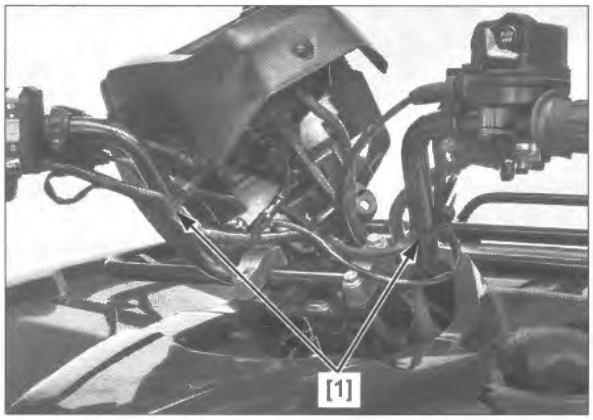
HANDLEBAR

REMOVAL

Remove the bolts [1] and assist headlight assembly [2].



Remove the wire bands [1].

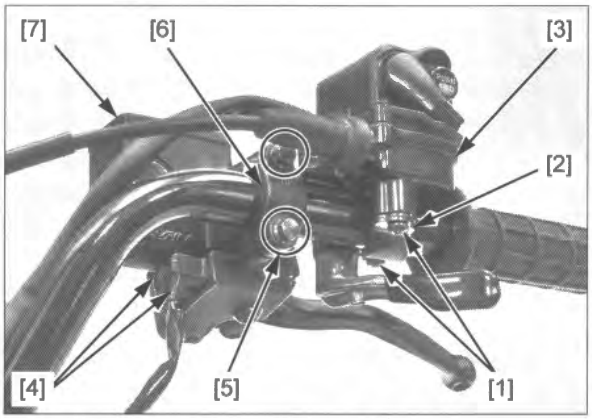


Remove the screws [1], throttle housing holder [2] and throttle housing [3].

Disconnect the front brake inhibitor switch wire connectors [4].

Keep the master cylinder reservoir upright to prevent air from entering the hydraulic system.

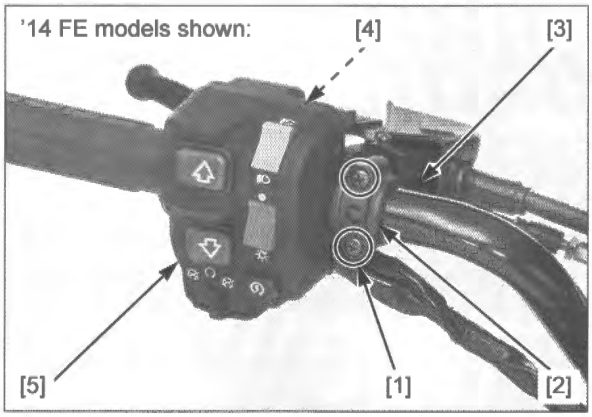
Remove the bolts [5], master cylinder holder [6] and brake master cylinder [7].



Remove the screws [1], lever bracket holder [2] and rear brake lever bracket [3].

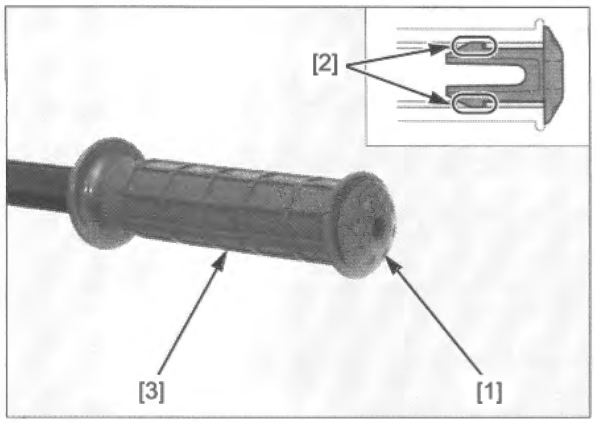
FE/FA models: Remove the three screws [4] and handlebar switch [5].

FM models: Remove the two screws and handlebar switch.

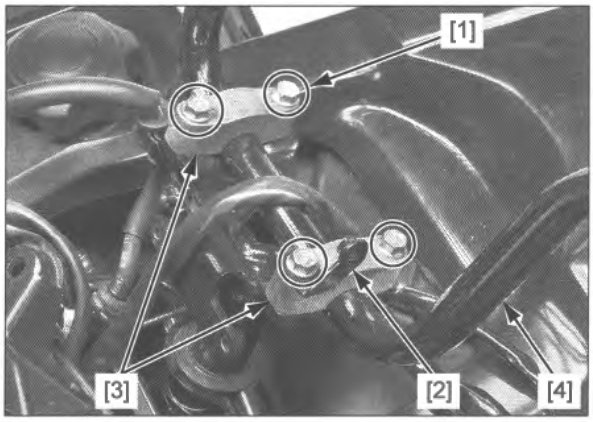


Remove the grip ends [1] (turn the grip end to release the setting tabs [2] and pry it using a screwdriver).

Remove the handlebar grips [3].



Remove the bolts [1], stay [2], upper holders [3] and handlebar [4].

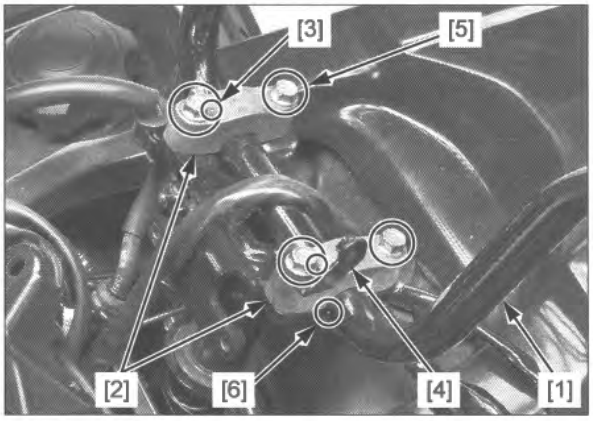


INSTALLATION

Align the punch mark [6] on the handlebar with the top edge of the lower holder.

Install the handlebar [1] and upper holders [2] with the punch mark [3] facing forward.
Install the stay [4] and tighten the bolts [5] securely.

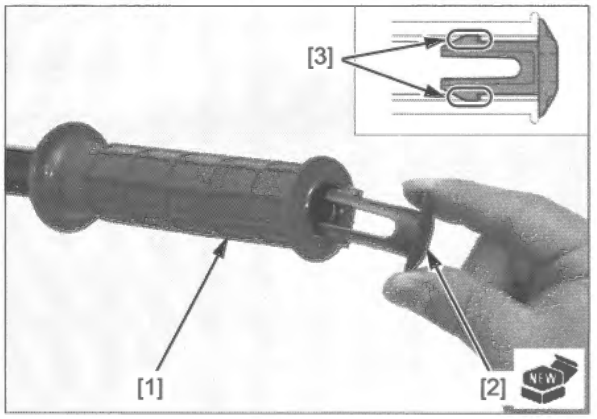
- Tighten the front bolts first, then tighten the rear bolts.



Allow the adhesive to dry for an hour before using.

Apply Honda Bond A or Pro Honda Handgrip Cement (U.S.A. only) to the inside surface of each handlebar grip [1] and to the clean surfaces of the handlebar.
Wait 3 – 5 minutes and install the grips. Rotate the grip for even application of the adhesive.

Install new grip ends [2] by aligning the tabs [3] with the holes in the handlebar.



FM models: Align the locating pin on the switch housing with the hole in the handlebar.

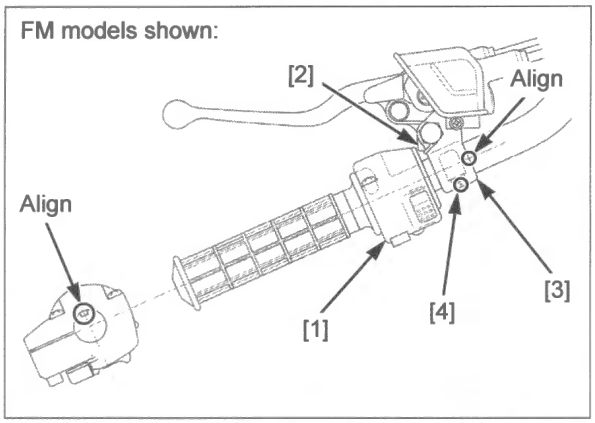
Install the handlebar switch [1]. Tighten the upper screw first, then tighten the lower screw to the specified torque.

TORQUE: 2.7 N·m (0.3 kgf·m, 2.0 lbf·ft)

Align the edge of the bracket with the punch mark on the handlebar.

Install the brake lever bracket [2] and holder [3] with the punch mark [4] facing up.
Tighten the upper screw first, then tighten the lower screw to the specified torque.

TORQUE: 4.2 N·m (0.4 kgf·m, 3.1 lbf·ft)

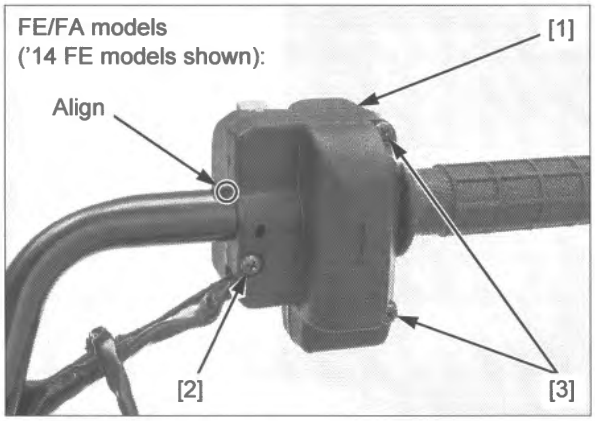


FE/FA models: Align the seam of the switch with the punch mark on the handlebar.

Install the handlebar switch [1] and tighten the screws to the specified torque.

- Tighten the inside screw [2] first, then tighten the outside screws [3].

TORQUE: 2.7 N·m (0.3 kgf·m, 2.0 lbf·ft)

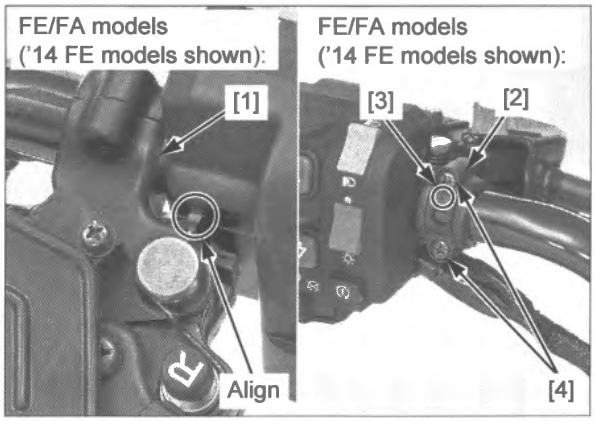


FE/FA models: Align the locating pin on the bracket with the hole in the switch housing.

Install the brake lever bracket [1] and holder [2] with the punch mark [3] facing up.
Tighten the screws [4] to the specified torque.

- Tighten the upper screw first, then tighten the lower screw.

TORQUE: 4.2 N·m (0.4 kgf·m, 3.1 lbf·ft)



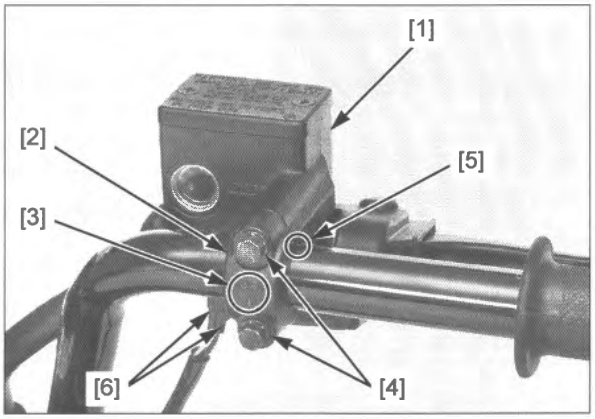
Align the edge of the master cylinder with the punch mark [5] on the handlebar.

Install the brake master cylinder [1] and holder [2] with the "UP" mark [3] facing up. Tighten the bolts [4] to the specified torque.

- Tighten the upper bolt first, then tighten the lower bolt.

TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)

Connect the front brake inhibitor switch wire connectors [6].

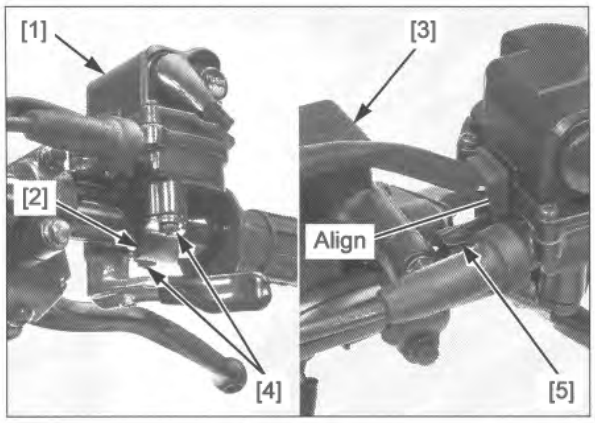


Align the lug [5] on the throttle housing with the mating line of the master cylinder and holder.

Install the throttle housing [1] and holder [2] against the master cylinder [3]. Tighten the screws [4] to the specified torque.

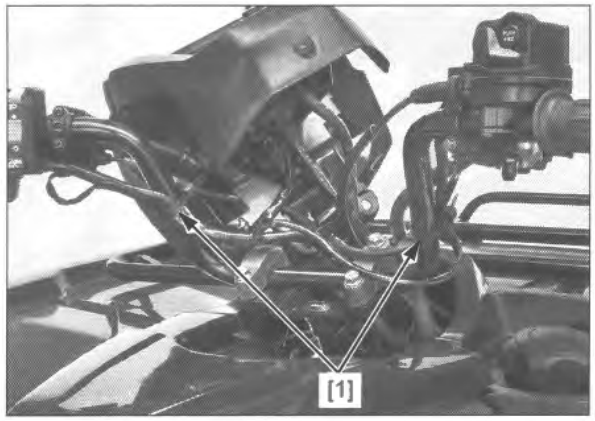
- Tighten the front screw first, then tighten the rear screw.

TORQUE: 4.2 N·m (0.4 kgf·m, 3.1 lbf·ft)

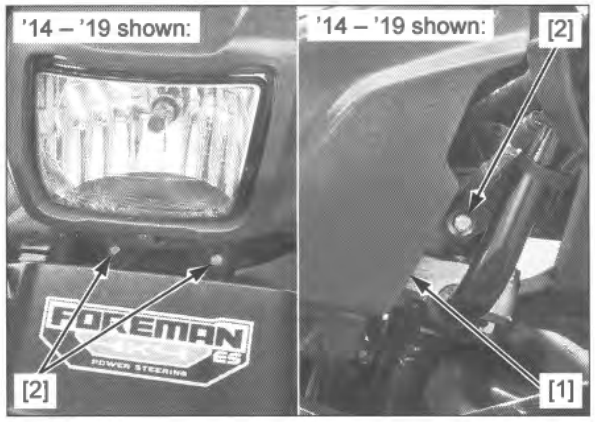


Tighten the wire bands [1].

- Route the wires properly (page 1-31).



Install the assist headlight assembly [1] and tighten the bolts [2] securely.



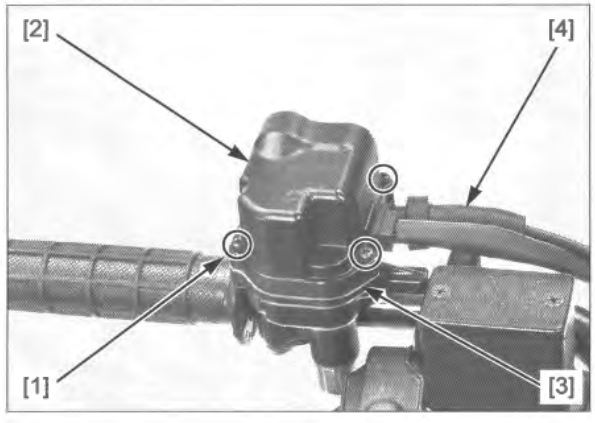
THROTTLE HOUSING

DISASSEMBLY

Remove the following:

- screws [1]
- right handlebar switch [2]
- gasket [3]

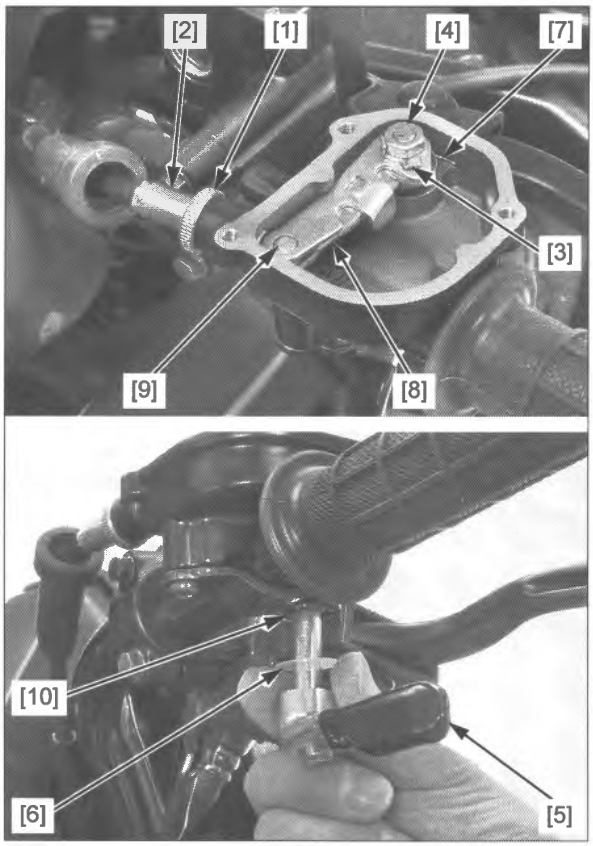
Slide the boot [4] off the throttle cable adjuster.



Loosen the lock nut [1] and cable adjuster [2].

Bend down the tab of the lock washer [3] and remove the following:

- pivot nut [4]
- throttle lever [5] and plastic washer [6]
- return spring [7]
- throttle arm [8] (by disconnecting the cable [9])
- dust seal [10] (from the housing)



ASSEMBLY

Coat the lips of a new dust seal [1] with grease and install it into the housing until it is fully seated.

Apply grease to the throttle lever pivot [2] in the housing and to the throttle cable end.

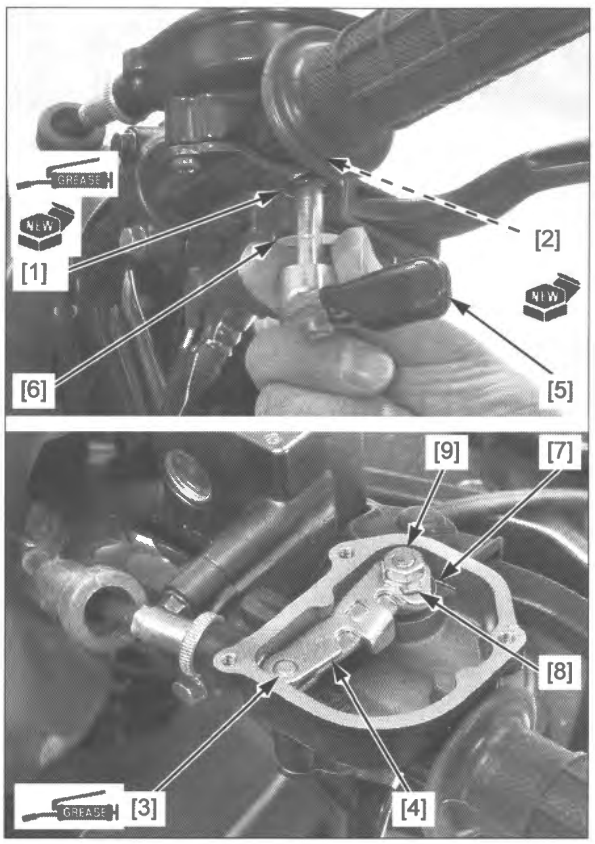
Connect the cable [3] to the throttle arm [4].

Insert the throttle lever [5] with the plastic washer [6] into the housing.
Install the throttle arm with the return spring [7] over the throttle lever pivot by aligning the flat surfaces.

Install a new lock washer [8] and the pivot nut [9], and tighten it to the specified torque.

TORQUE: 7.0 N·m (0.7 kgf·m, 5.2 lbf·ft)

Bend up the lock washer tab against the nut.

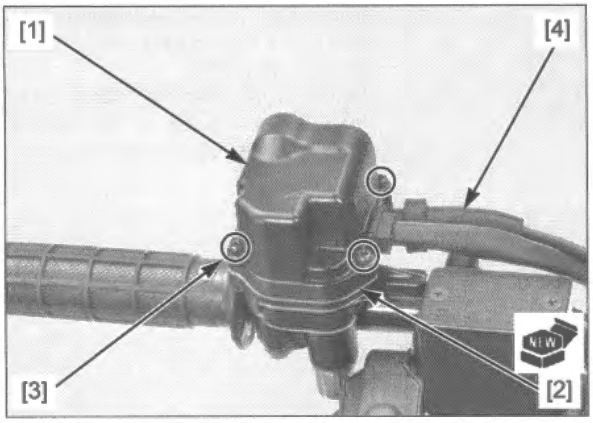


Install the right handlebar switch [1] with a new gasket [2] and tighten the screws [3] to the specified torque.

TORQUE: 1.5 N·m (0.2 kgf·m, 1.1 lbf·ft)

Install the boot [4] on the throttle cable adjuster.

Adjust the throttle lever freeplay (page 3-4).



FRONT WHEEL

REMOVAL

Loosen the wheel nuts [1].

Support the vehicle using a hoist or equivalent and raise the front wheels off the ground.

Remove the wheel nuts and wheel.

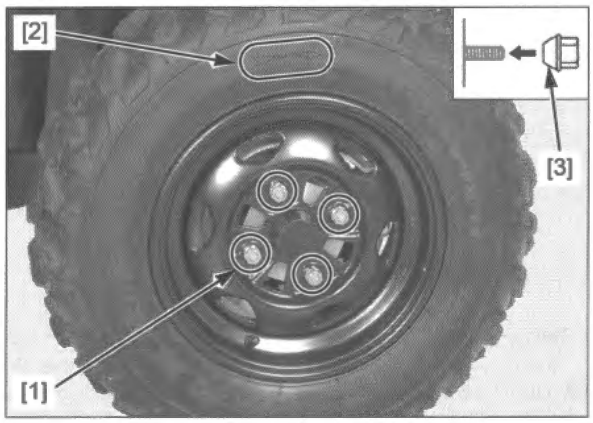
INSTALLATION

Do not interchange the left and right wheels

Install the front wheel with the tire valve facing out and the arrow mark [2] facing in the normal rotating direction.

Install the wheel nuts with the tapered side [3] facing inward and tighten them to the specified torque.

TORQUE:
Except FM7/FA7: 64 N·m (6.5 kgf·m, 47 lbf·ft)
FM7/FA7: 84 N·m (8.6 kgf·m, 62 lbf·ft)



TIRES

REMOVAL

NOTE:

- This service requires the ATV Bead Buster (KLS379024).
- Remove and install the tire from the rim side opposite the valve stem.

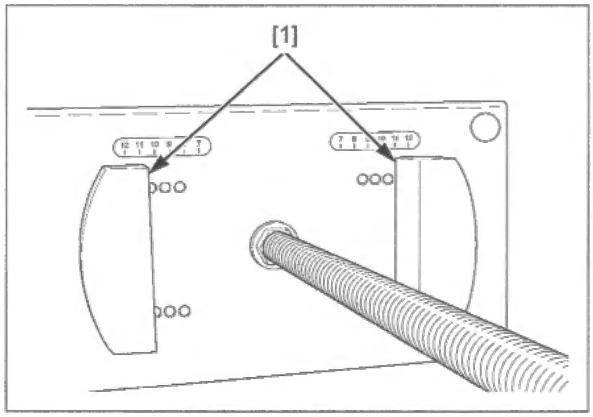
Remove the core from the valve stem.

Use a pneumatic tire changer or equivalent to remove the tire from the rim. If a tire changer is not available, rim protectors and tire irons may be used.

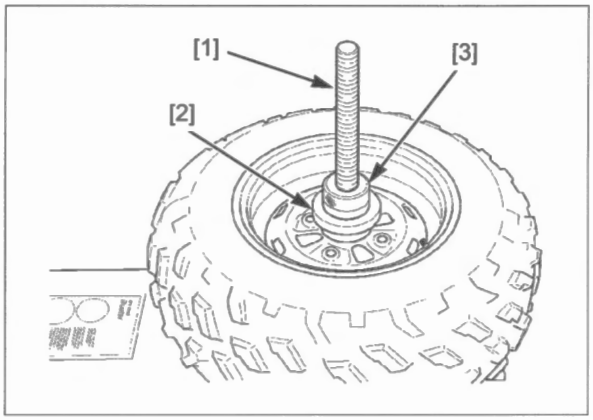
Adjust the bottom rim supports [1] to the proper rim size. Align the flat side of the support with the corresponding rim size indicator.

Use only water as a lubricant when removing or mounting tires. Soap or some mounting lubricants may leave a slippery residue that can cause the tire to shift on the rim and lose tire pressure during riding.

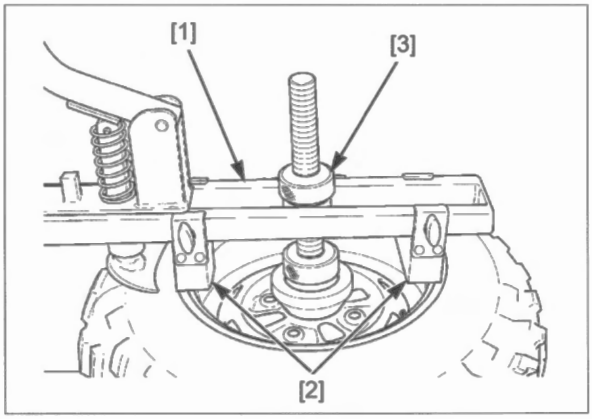
Lube the bead area of the tire with water, pressing down on the tire sidewall/bead area in several places to allow the water to run into and around the bead.



Place the wheel assembly over the center shaft [1] and use the correct size cone [2] to keep the wheel centered during operation.
Install the bottom hold down nut [3], bearing side down, and finger tighten it so the wheel can rotate freely during operation.

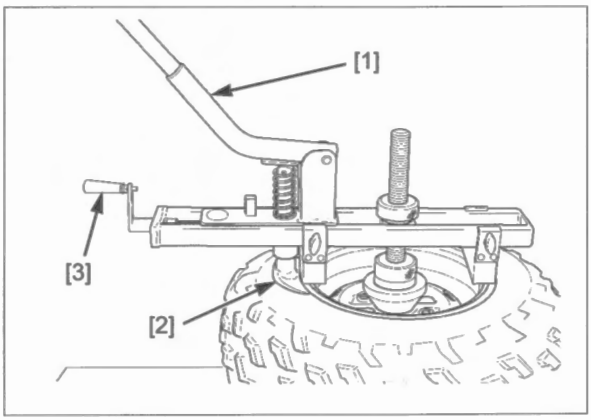


Install the breaker arm assembly [1] over the center shaft and adjust the upper rim supports [2] to fit the outside rim diameter.
Install the top hold down nut [3] and tighten it finger tight.



Failure to back out the breaker shoe two turns will cause the shoe to scratch the bead lock, which may cause the tire to leak.

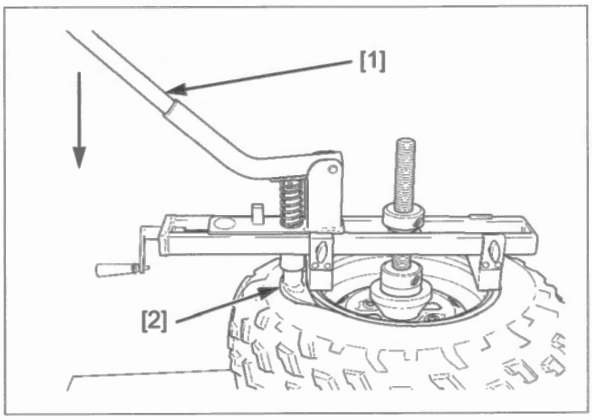
Pull the leverage bar [1] down so the breaker shoe [2] is just below the rim lip. Turn the crank [3] to fully push the breaker shoe between the tire bead and rim. Once the shoe contacts the rim, back the crank out two turns to allow the shoe to clear the rim's bead lock.



Push down on the leverage bar [1] to push the tire bead over the bead lock. Use only short strokes on the handle. While the shoe [2] is still engaged, turn the wheel as far as it will go between strokes as you break the bead around the rim.

Remove the breaker arm assembly and flip the wheel over. Install the breaker arm assembly, adjust the shoe properly and break the other bead by following the above procedures.

Remove the tire from the rim using a tire changing machine or tire irons and rim protectors.

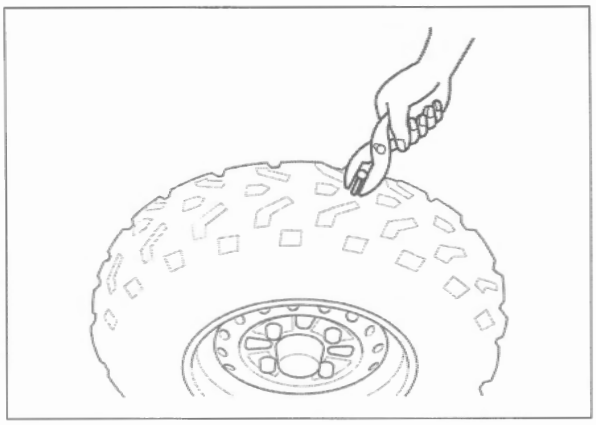


TIRE REPAIR

NOTE:

- Use the manufacturer's instructions for the tire repair kit you are using. If your kit does not have instructions, use the procedures provided here.

Check the tire for puncturing objects.
Chalk mark the punctured area and remove the puncturing object.
Inspect and measure the puncture hole.
Tire repairs for puncture holes larger than 15 mm (0.6 in) should be a section repair.
Section repairs should be done by a professional tire repair shop.
If the puncture hole is smaller than 15 mm (0.6 in), proceed with the repair as described here.



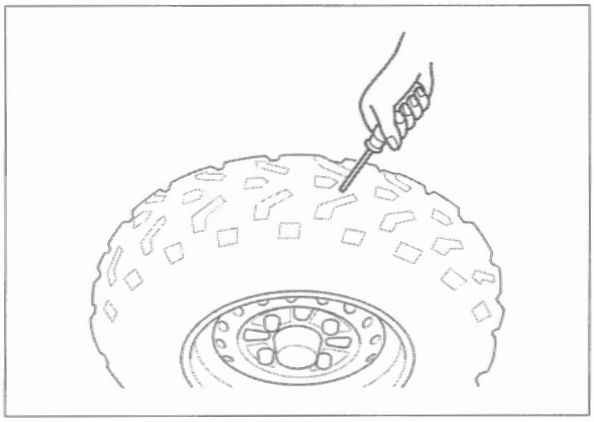
Install a rubber plug into the puncture hole as follows:

Apply a cement to a plug inserting needle and work the needle into the puncture hole to clean and lubricate it.
Do this three times.
Do not let the cement dry.

Be careful not to push the plug all the way into the tire to prevent it from falling inside.

Insert and center a rubber plug through the eye of the inserting needle.

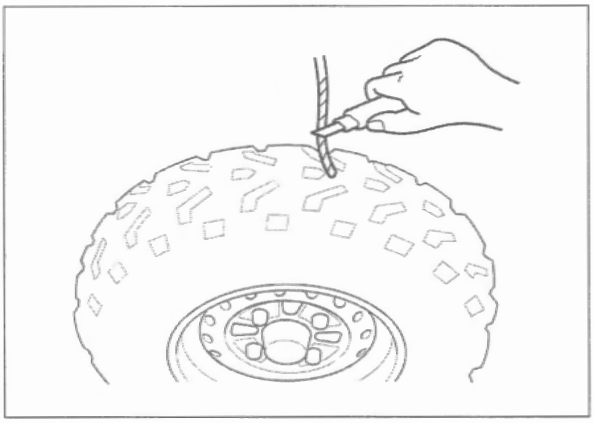
Apply cement to the rubber plug.
Push the inserting needle with plug into the puncture hole until the plug is slightly above the tire.
Twist the needle and remove it from the tire; the plug will stay in the tire.



Trim the plug 6 mm (0.2 in) above the tire surface.
Repeat the above procedure if the puncture is large.
Do not use more than two plugs per puncture hole.

Allow the repair to dry. Drying time will vary with air temperature. Refer to the tire repair kit manufacturer's recommendations.

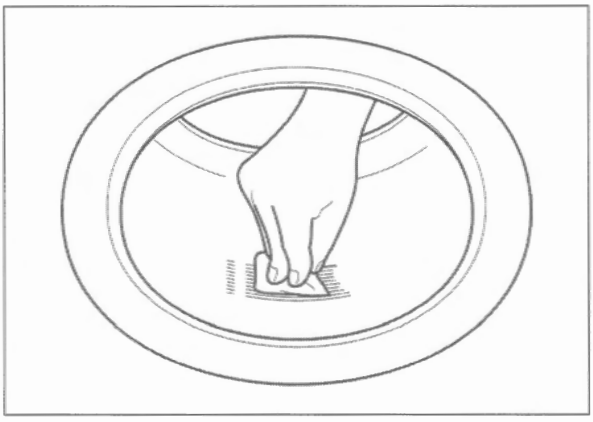
Inflate the tire and test the seal by dabbing a small amount of cement around the plug. Escaping air will cause a bubble in the cement. If there is leakage, remove the tire (page 18-11) and apply a cold patch to the inside of the tire as described below:



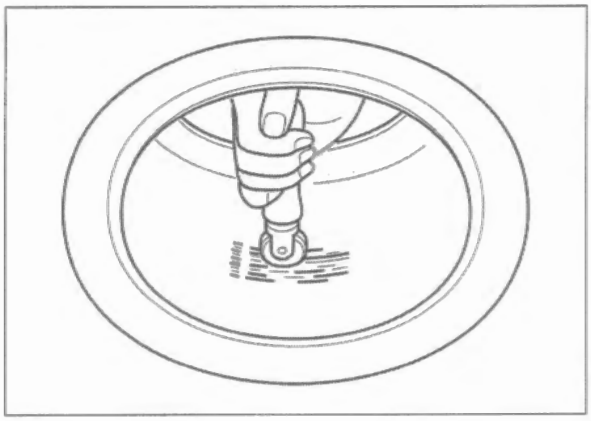
If a plug has been inserted, trim it even with the inner tire surface.

Temporarily place a rubber patch that is at least twice the size of the puncture hole over it. Make a mark around the patch, slightly larger than the patch itself.
Rough the area marked inside the tire with a tire buffer or a wire brush. Clean the rubber dust from the buffed area.

Apply cement over the area marked and allow it to dry until tacky.
Do not touch the cement with dirty or greasy hands.
Remove the lining from the patch and center it over the puncture hole.

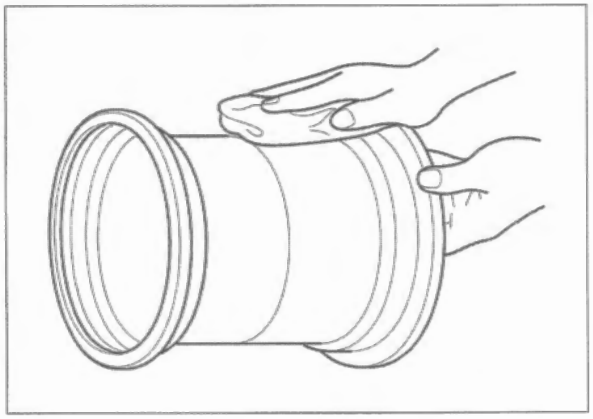


Press the patch against the puncture hole using a special roller.



INSTALLATION

Install the tire onto the rim, where the rim shoulder width is the narrowest, to simplify installation.



Clean the rim bead seat and flanges.

Use only water as a lubricant when removing or mounting tires. Soap or some mounting lubricants may leave a slippery residue which can cause the tire to shift on the rim and lose air pressure during riding.

Apply clean water to the rim flanges, bead seat and base.

Install the valve core in the valve stem.
Install the tire with the arrow mark facing in the normal rotating direction.
Inflate the tire to seat the tire bead.

Deflate the tire. Wait 1 hour and inflate the tire to the specified pressure.

RECOMMENDED TIRE PRESSURE

Front:	**Standard:**	**30 kPa (0.30 kgf/cm², 4.4 psi)**
	With cargo:	**30 kPa (0.30 kgf/cm², 4.4 psi)**
Rear:	**Standard:**	**30 kPa (0.30 kgf/cm², 4.4 psi)**
	With cargo:	**30 kPa (0.30 kgf/cm², 4.4 psi)**

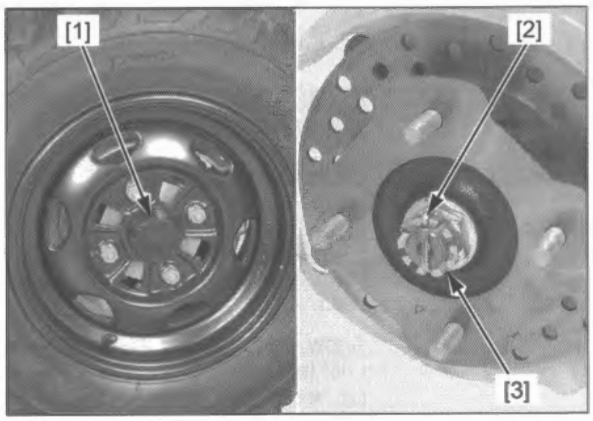
Check for air leaks and install the valve cap.

FRONT WHEEL HUB/KNUCKLE

REMOVAL

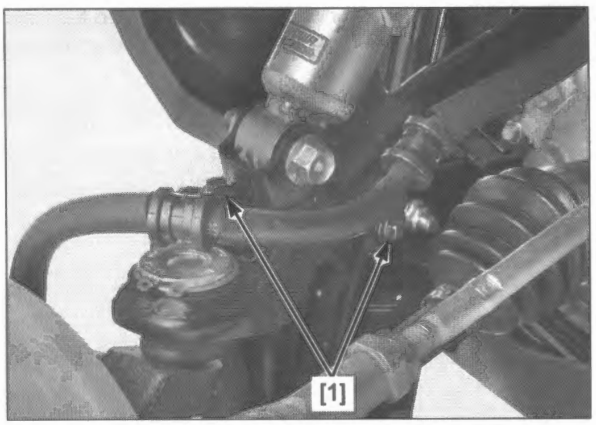
Remove the wheel center cap [1] and cotter pin [2].

Apply front brake and loosen the hub nut [3].



Remove the front wheel (page 18-11).

Remove the two hose clamp bolts [1] from the upper arm.

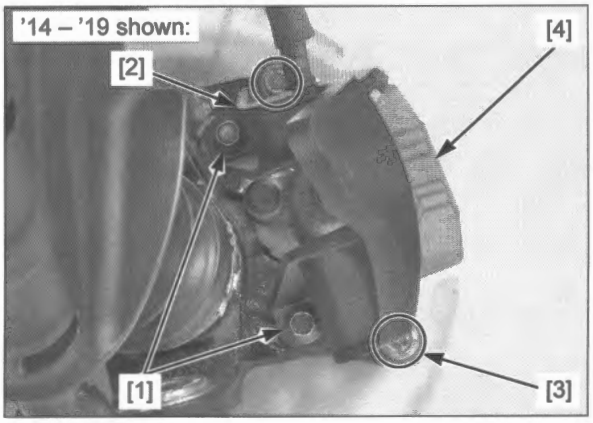


Remove the two setting bolts [1] and outboard guard [2].

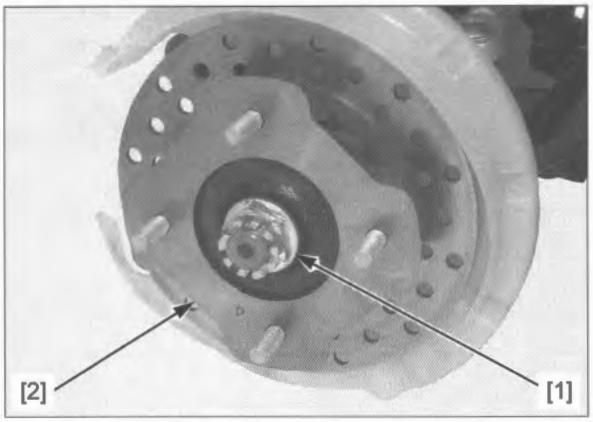
Support the caliper so that it does not hang from the brake hose. Do not twist or bend the brake hose.

Remove the following:

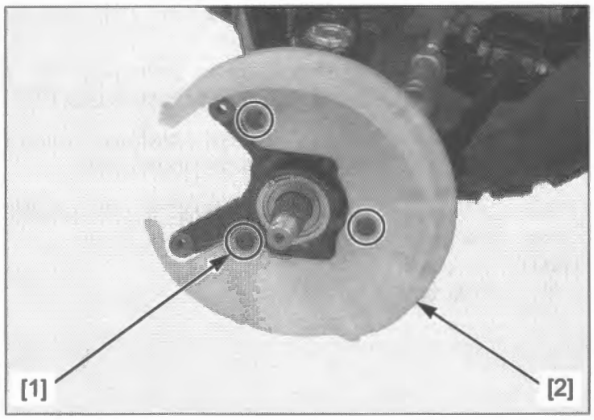
- two mounting bolts [3]
- brake caliper [4]



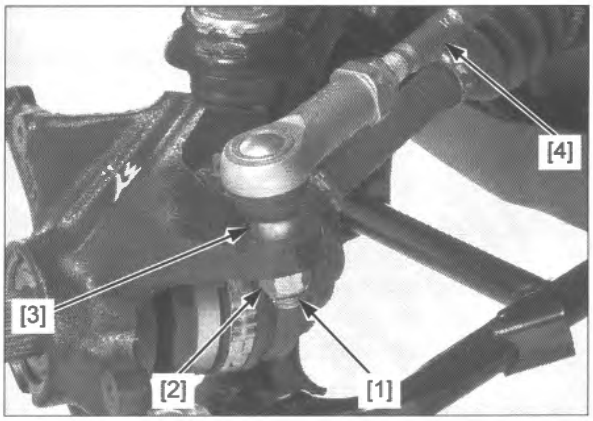
- hub nut [1]
- wheel hub [2]



- three socket bolts [1]
- splash guard [2]

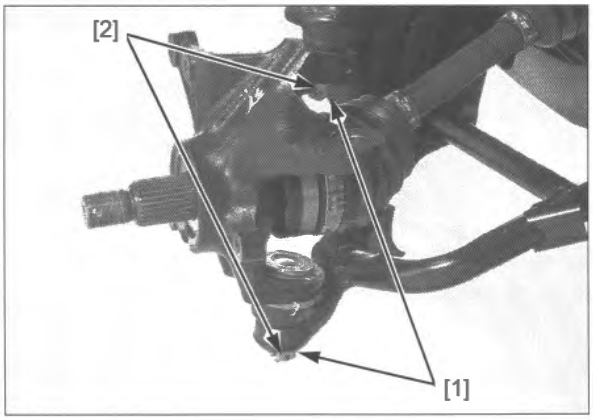


– cotter pin [1] (from the tie-rod ball joint stud)
– ball joint nut [2] (by holding the joint stud flat surfaces [3])
– tie-rod [4]



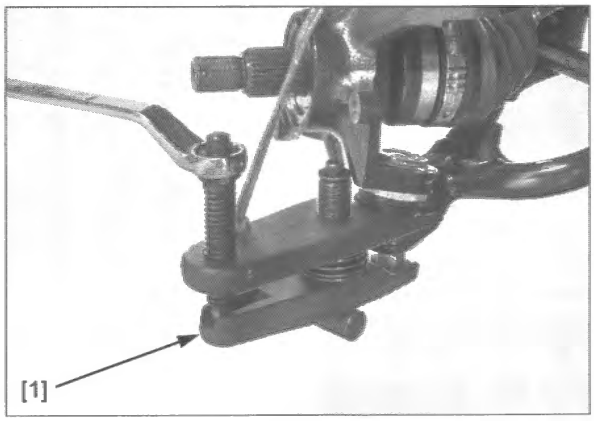
– cotter pins [1]

Loosen the ball joint nuts [2], but do not remove them yet.



Release the ball joints, using the special tool according to the following instructions.

TOOL:
[1] REMOVER, BALL JOIN **07MAC-SL00201 or 07MAC-SL00202 (U.S.A. only)**

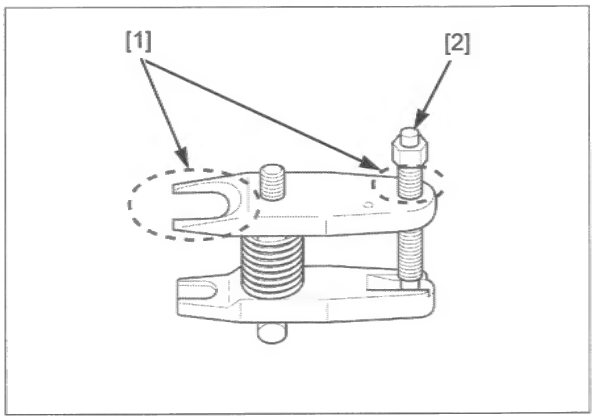


Apply grease to the ball joint remover at the point [1] shown.
This will ease installation of the tool and prevent damage to the pressure bolt [2] threads.

Insert the jaws carefully, making sure that you do not damage the ball joint boot.

If necessary, apply penetrating type lubricant to loosen the ball joint.

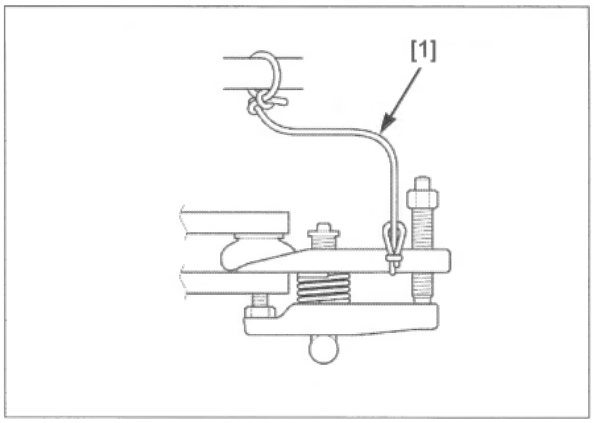
Adjust the jaw spacing by turning the pressure bolt.



To prevent the tool from dropping, tie the strap [1] on a neighboring solid part such as the suspension arm, tie-rod, etc. before operation.

NOTE:

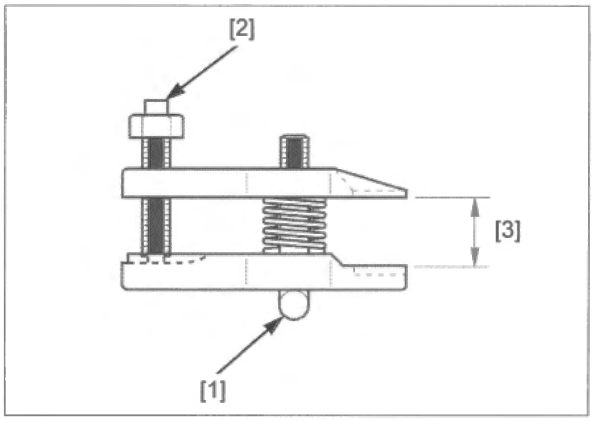
- Do not tie the strap on the brake hose, brake pipe, rubber boot, and other parts that can be damaged easily.



Once the tool is in place, turn the adjusting bolt [1] as necessary to make the jaws parallel.
Then hand-tighten the pressure bolt [2] and recheck the jaws to make sure they are still parallel [3].

Tighten the pressure bolt with a wrench until the ball joint stud pops loose.

Remove the ball joint nuts and the knuckle from the upper and lower arms.

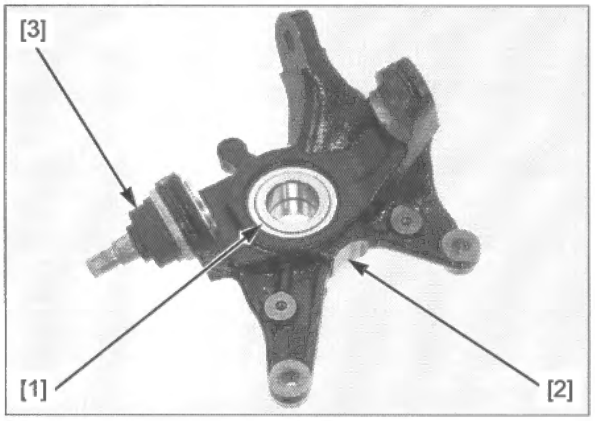


INSPECTION

Turn the inner race of each bearing [1] in the knuckle [2] with your finger. The bearings should turn smoothly and quietly. Also check that the bearing outer race fits tightly in the knuckle.

Inspect the knuckle for damage or cracks.

Inspect the ball joint boot [3] for tears or other damage by moving the ball joint stud.
It should move freely and smoothly.



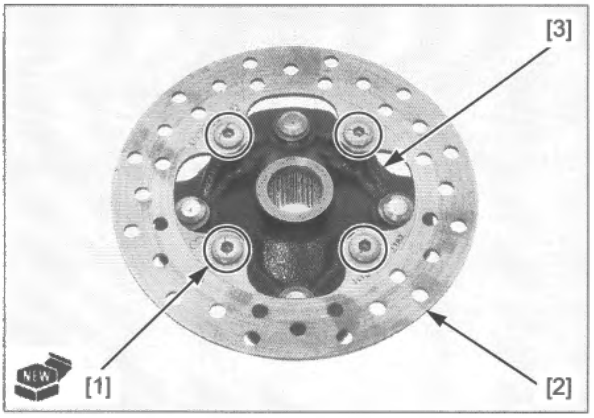
BRAKE DISC REPLACEMENT

Remove the four disc bolts [1] and brake disc [2] from the wheel hub [3].

Do not get grease on the brake disc or stopping power will be reduced.

Install a new brake disc with new disc bolts and tighten them to the specified torque.

TORQUE: 42 N·m (4.3 kgf·m, 31 lbf·ft)

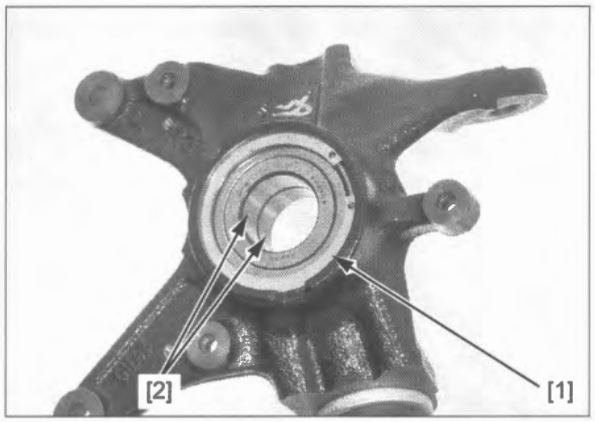


BEARING REPLACEMENT

Remove the snap ring [1] and drive the bearings [2] out of the knuckle.

TOOLS:

Driver	**07749-0010000**
Attachment, 40 x 42 mm	**07746-0010900**

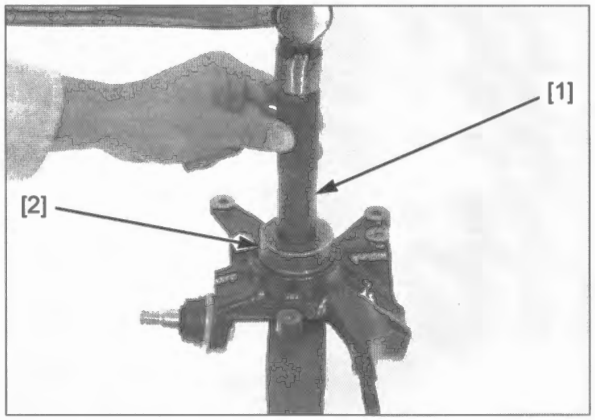


Pack the cavities of a new bearings with grease.
Drive in the bearing squarely with the marked side facing up until they are fully seated.

TOOLS:

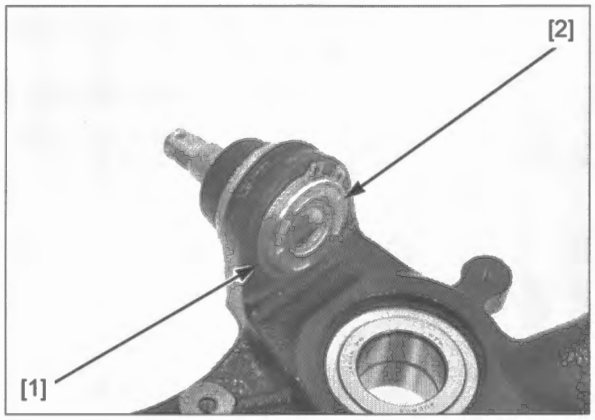
[1] Driver	**07749-0010000**
[2] Attachment, 52 x 55 mm	**07746-0010400**

Install the snap ring into the knuckle groove with the chamfered side facing in.



BALL JOINT REPLACEMENT

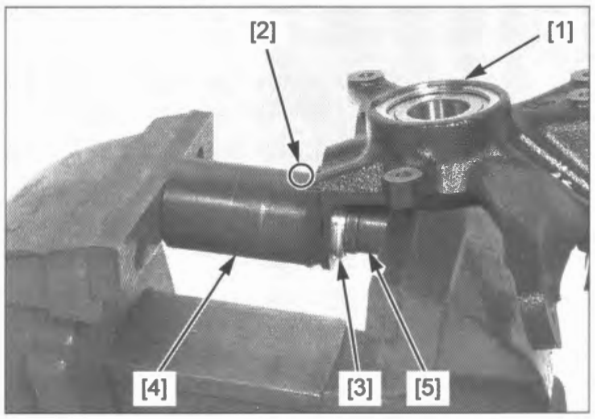
Remove the snap ring [1] from the ball joint [2].



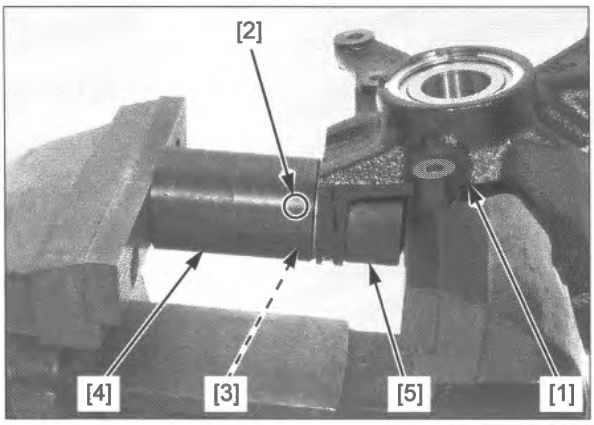
Set the knuckle [1] and special tools with "A" mark [2] side of the remover/installer facing the ball joint in the vise as shown.
Press the ball joint [3] out of the knuckle.

TOOLS:

[4] Remover/Installer 42.5 x 43 mm	**07WMF-HN00100**
[5] Attachment, 28 x 30	**07946-1870100**



Set the knuckle [1] and special tools with "B" mark [2] side of the remover/installer facing the ball joint [3] in the vise as shown.
Press the ball joint into the knuckle until it is fully seated.



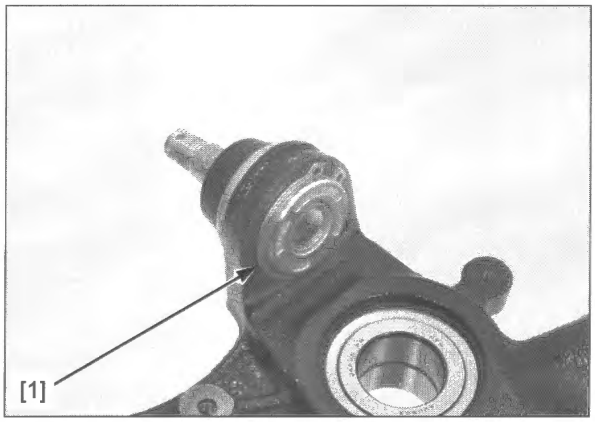
TOOLS:

[4] Remover/Installer 42.5 x 43 mm	**07WMF-HN00100**
[5] Driver, Inner 20 mm	**07746-0020400**

NOTICE

If you feel strong resistance when compressing the vise, stop. Reset the attachment of the tool so that the ball joint head can go into the hollow of the attachment and try again.

Install the snap ring [1] with the chamfered edge facing the knuckle.



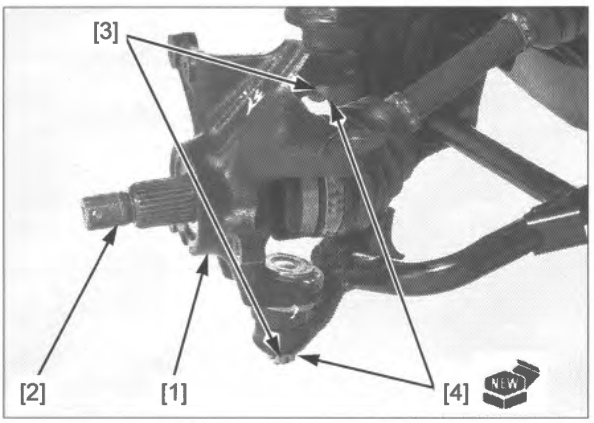
INSTALLATION

Install the knuckle [1] onto the drive shaft [2], and lower and upper arms with the ball joint nuts [3].

Tighten each joint nut to the specified torque and further tighten until its grooves align with the cotter pin hole.

TORQUE: 29 N·m (3.0 kgf·m, 21 lbf·ft)

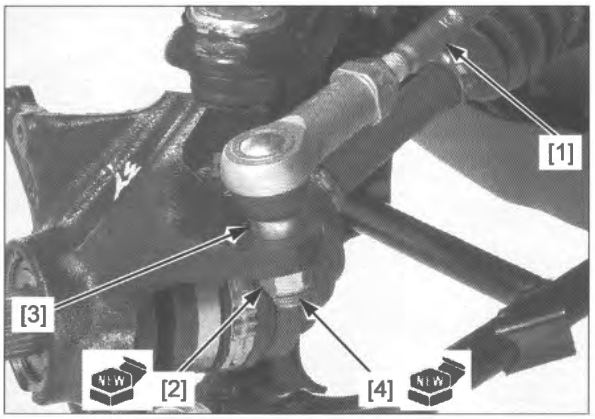
Install new cotter pins [4].



Install the tie-rod [1] into the knuckle with a new joint nut [2].
Tighten the nut to the specified torque by holding the joint stud flat surfaces [3].

TORQUE: 54 N·m (5.5 kgf·m, 40 lbf·ft)

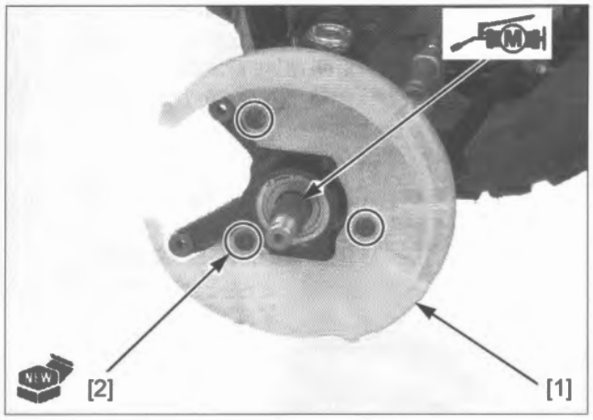
Install a new cotter pin [4].



Install the splash guard [1] with new bolts [2] and tighten them to the specified torque.

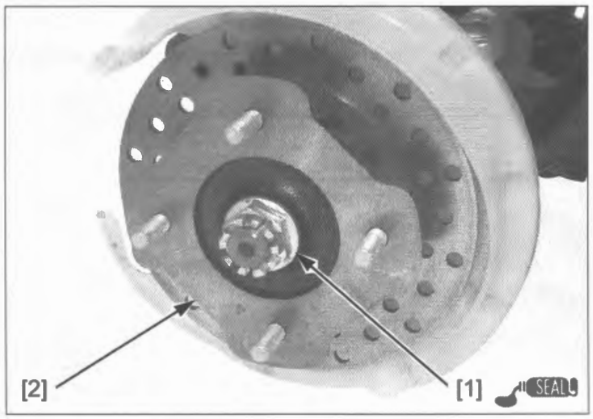
TORQUE: 11 N·m (1.1 kgf·m, 8 lbf·ft)

Apply molybdenum disulfide grease to the drive shaft splines.



Apply sealant to the wheel hub nut [1] threads (page 1-17).

Install the wheel hub [2] and hub nut.

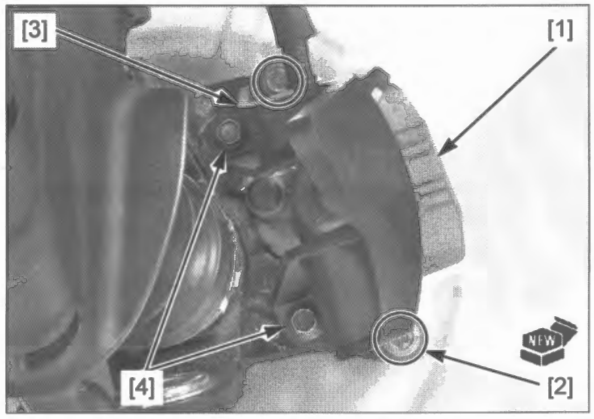


Install the brake caliper [1] with new mounting bolts [2] and tighten them to the specified torque.

TORQUE: 30 N·m (3.1 kgf·m, 22 lbf·ft)

Install the outboard guard [3] and tighten the bolts [4] to the specified torque.

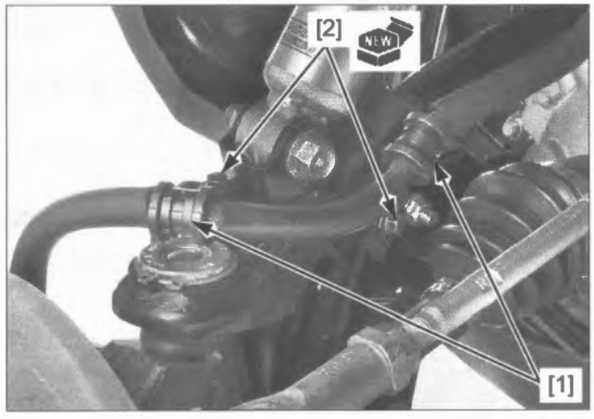
TORQUE: 11 N·m (1.1 kgf·m, 8 lbf·ft)



Install the hose clamps [1] with new clamp bolts [2] and tighten them to the specified torque.

TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)

Install the front wheel (page 18-11).

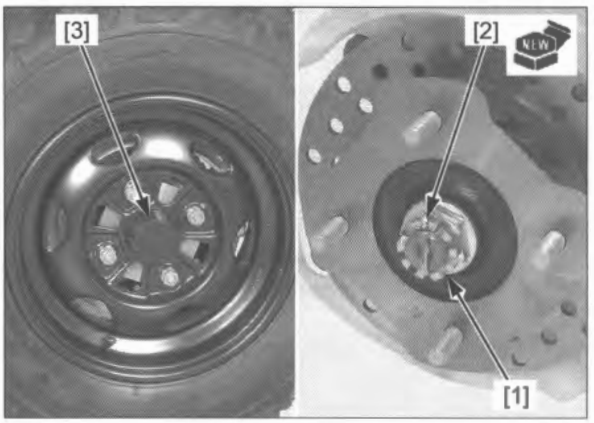


Apply front brake, tighten the hub nut [1] to the specified torque and further tighten until its grooves align with the cotter pin hole.

TORQUE: 137 N·m (14.0 kgf·m, 101 lbf·ft)

Install a new cotter pin [2].

Install the wheel center cap [3].



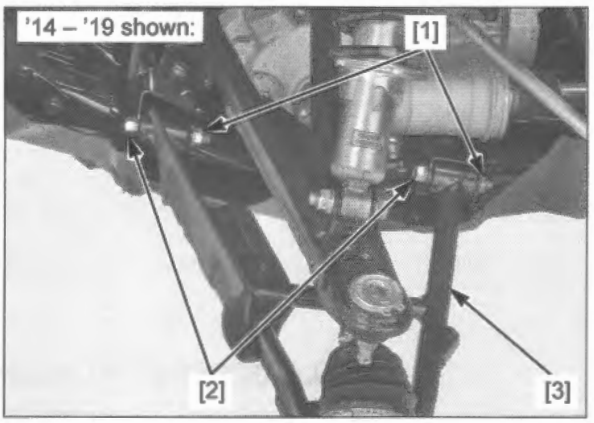
SUSPENSION ARM

REMOVAL

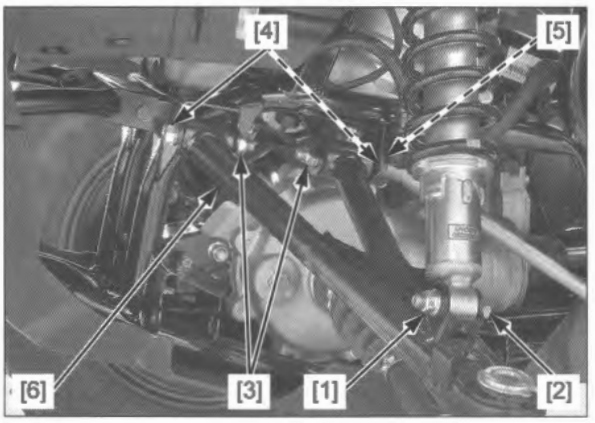
Remove the wheel hub and knuckle (page 18-14).

Remove the following:

- pivot nuts [1] and bolts [2]
- lower arm [3]



- shock absorber lower mounting nut [1] and bolt [2]
- pivot nuts [3], bolts [4] and stay [5]
- upper arm [6]



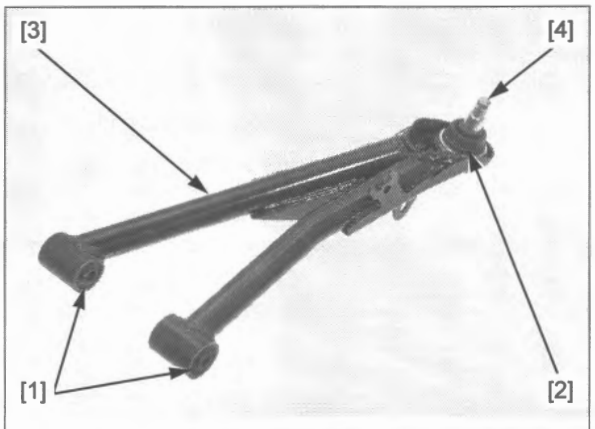
INSPECTION

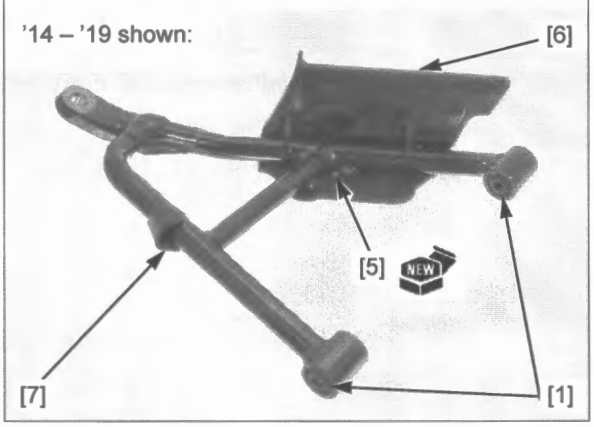
Check the pivot bushings [1] for wear or damage.

Inspect the ball joint boot [2] on the upper arm [3] for tears or other damage by moving the ball joint stud [4]. It should move freely and smoothly.

Remove the bolt [5] and inboard guard [6] from the lower arm [7] if necessary.

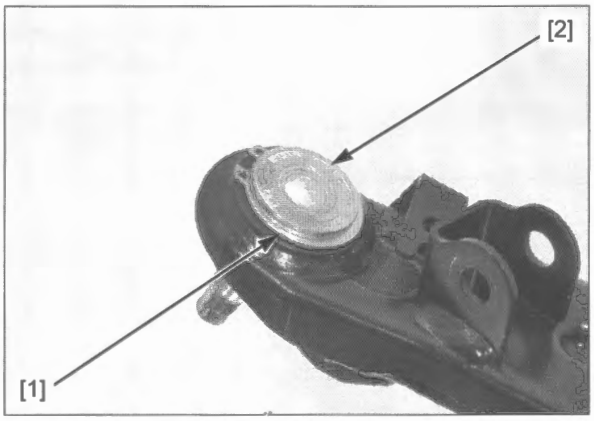
- Always replace the inboard guard bolt with a new one.





BALL JOINT REPLACEMENT

Remove the snap ring [1] from the ball joint [2].

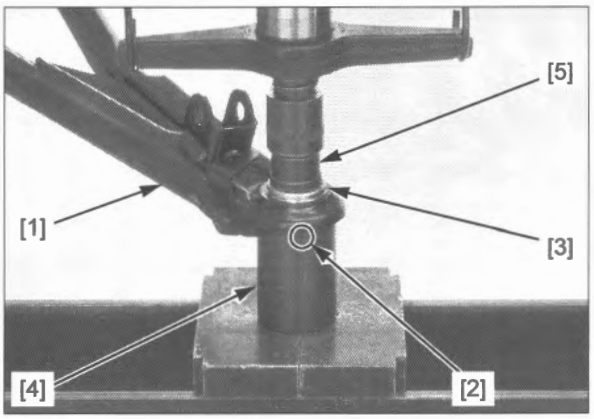


Set the upper arm [1] and special tools with "A" mark [2] side of the remover/installer facing the ball joint [3] in the hydraulic press as shown.
Press the ball joint out of the upper arm.

TOOLS:

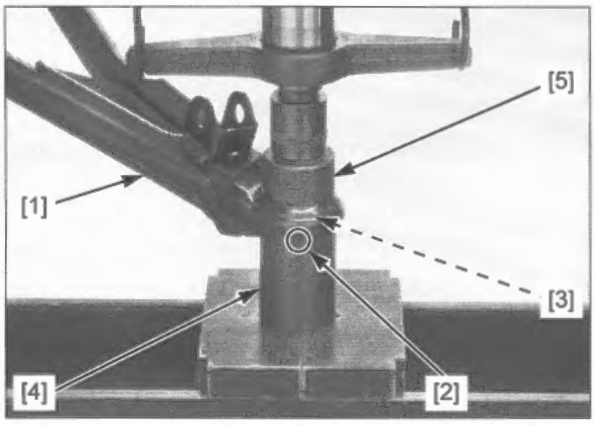
[4] Remover/Installer 42.5 x 43 mm 07WMF-HN00100

[5] Attachment, 28 x 30 07946-1870100



Set the upper arm [1] and special tools with "B" mark [2] side of the remover/installer facing the ball joint [3] as shown.
Press the ball joint into the upper arm until it is fully seated.

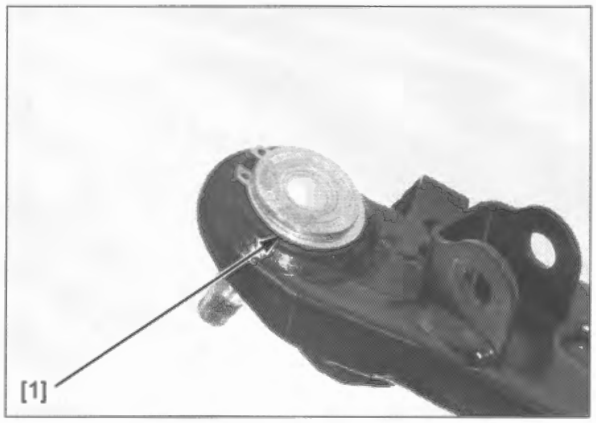
TOOLS:
[4] Remover/Installer 42.5 x 43 mm **07WMF-HN00100**
[5] Driver, Inner 20 mm **07746-0020400**



NOTICE

If you feel strong resistance when lowering the press, stop. Reset the attachment of the tool so that the ball joint head can go into the hollow of the attachment and try again.

Install the snap ring [1] with the chamfered edge facing upper arm.



INSTALLATION

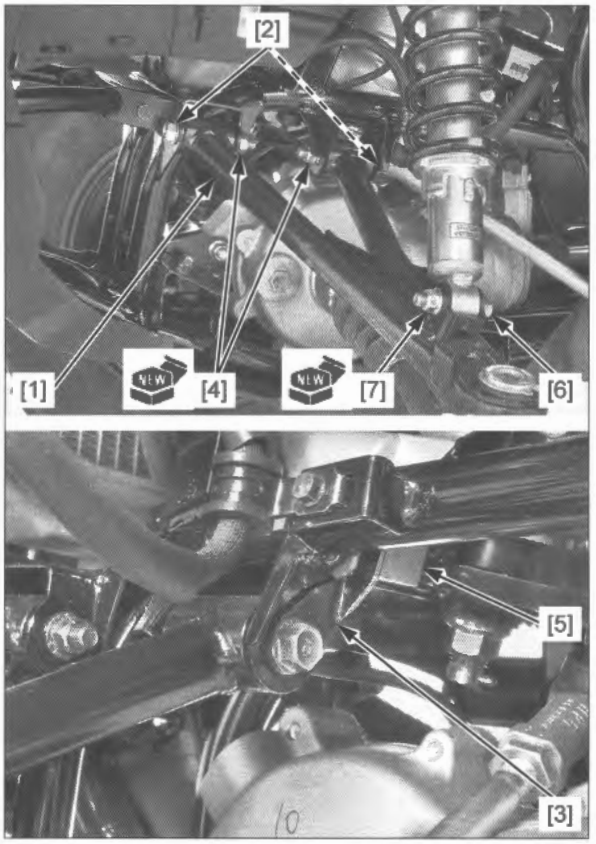
Insert the bolts from the out side.

Install the upper arm [1] into the frame with the bolts [2], stay [3] and new nuts [4] securely.

- FM2/FM6/FM7/FE2/FA6/FA7: Install the stay between the frame and EPS unit [5].

Insert the bolt from the rear side.

Connect the shock absorber to the upper arm with the bolt [6] (10 x 45 mm) and a new nut [7] to the specified torque.

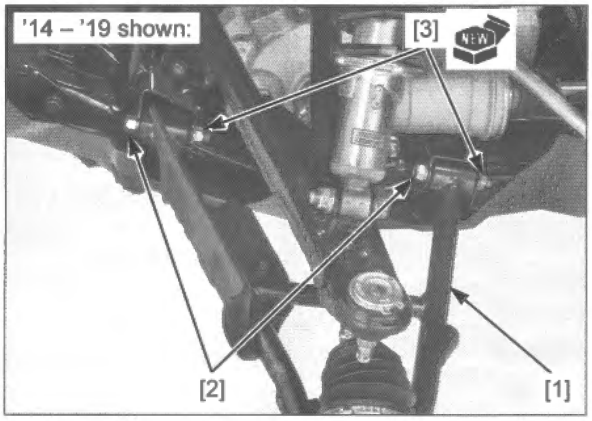


Insert the bolts from the front side.

Install the lower arm [1] with the pivot bolts [2] and new nuts [3], and loosely tighten them.

Install the knuckle and wheel hub (page 18-19).

Install the front wheel (page 18-11).
Place the vehicle on level ground and tighten the lower arm pivot nuts securely.



FRONT SHOCK ABSORBER

REMOVAL/INSTALLATION

Support the vehicle using a hoist or equivalent and raise the front wheels off the ground.

Support the lower arm. Remove the mounting nuts [1] and bolts [2], and front shock absorber [3].

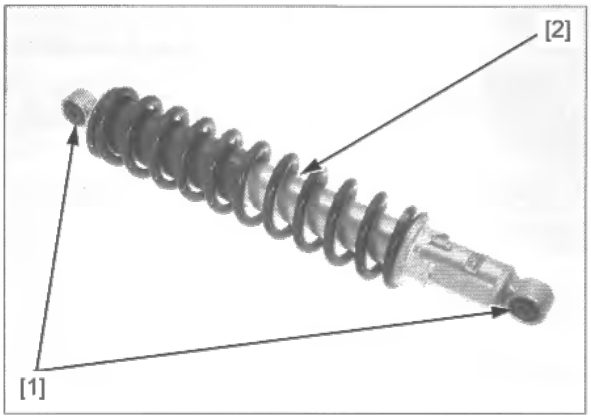
Insert the bolts from the rear side.

Install the shock absorber with the mounting bolts (upper: short, lower: long) and new nuts, and tighten them securely.



INSPECTION

Check the pivot collars and bushings [1] for wear or damage.
Check the damper unit [2] for leakage or other damage.
Replace the shock absorber assembly if necessary.



STEERING SHAFT (FM1/FE1/FM5/FA5)

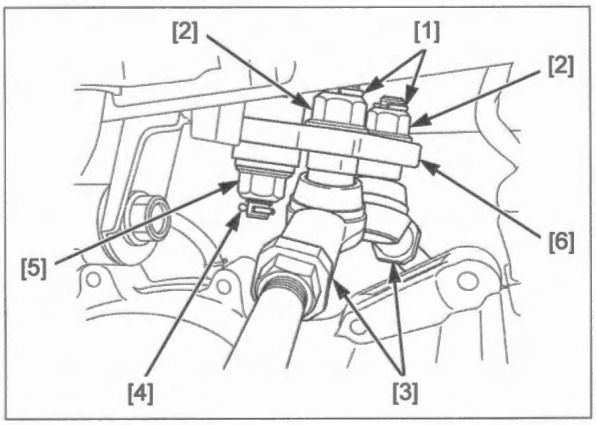
REMOVAL

Remove the following:

- front fender/carrier (page 2-8)
- assist headlight assembly (page 18-6)

Remove the following:

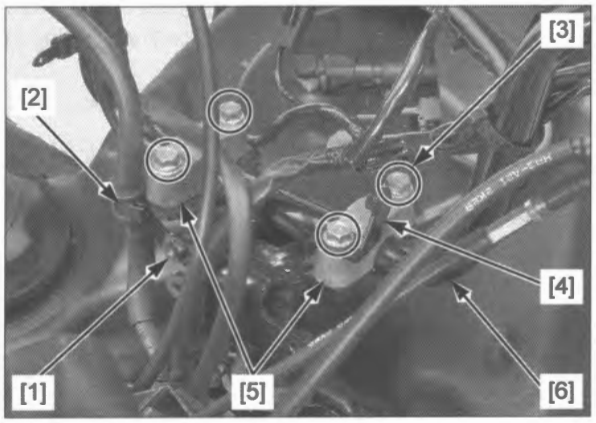
- cotter pins [1] (from the tie-rods)
- joint nuts [2] (by holding the joint stud flat surfaces)
- tie-rods [3] (from the steering arm)
- cotter pin [4] (from the steering shaft)
- shaft end nut and washer [5]
- steering arm [6]



Support the handlebar securely while keeping the master cylinder reservoir upright.

Remove the following:

- hose clamp bolt [1]
- hose clamp [2]
- handlebar holder bolts [3]
- stay [4]
- handlebar holders [5]
- handlebar assembly [6] (from the steering shaft)



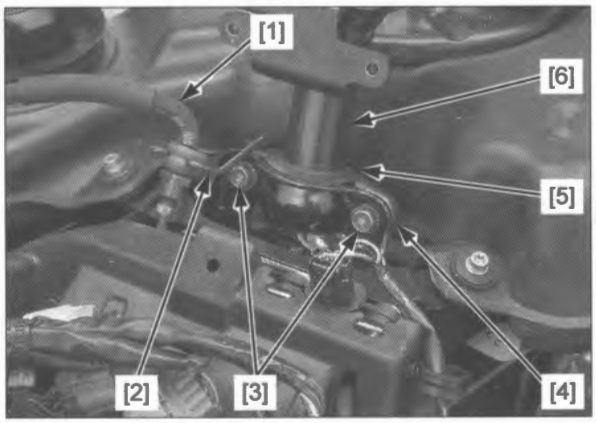
Release the brake hose [1] from the clamp [2].

Remove the following:

- bolts [3]
- steering shaft holder [4]
- shaft bushing [5]
- steering shaft [6]

Inspect the following:

- steering shaft for bend or distortion
- shaft bushing for damage or wear

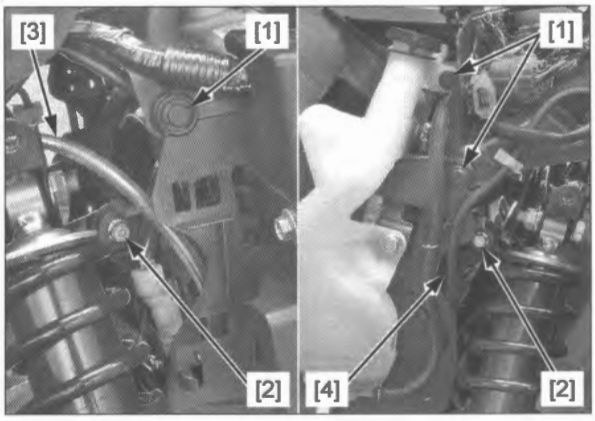


Remove the following:

- three trim clips [1]
- radiator mounting bolts [2]

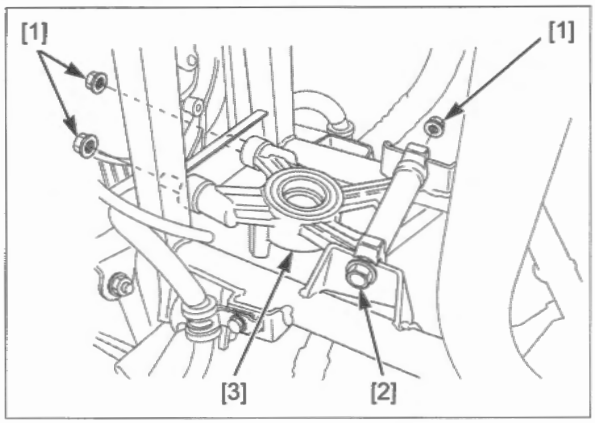
Release the fan motor breather hose [3] and front final drive breather hose [4] from the radiator grille covers.

Remove the radiator mounting bosses from the grommets and move the radiator assembly forward.



Remove the following:

- nuts [1]
- bolt [2]
- steering bearing holder [3]

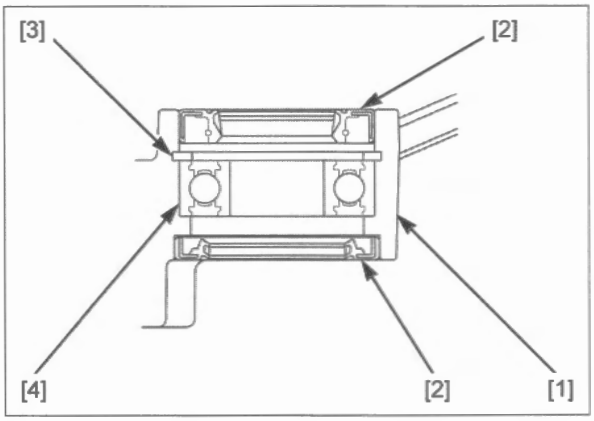


BEARING REPLACEMENT

Turn the inner race of the steering shaft bearing with your finger.
The bearing should turn smoothly and quietly. Also check that the bearing outer race fits tightly in the bearing holder.

Remove the following from the steering bearing holder [1]:

- dust seals [2]
- snap ring [3]
- bearing [4]

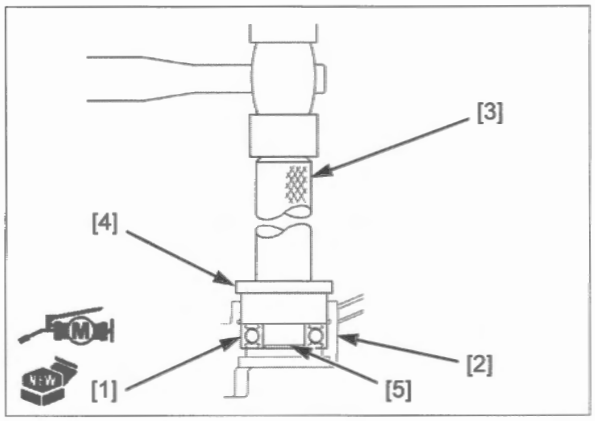


Fill up the bearing with 2.0 – 3.0 g (0.07 – 0.11 oz) of molybdenum disulfide grease.

Drive a new bearing [1] into the bearing holder [2] with the marked side facing up until it is fully seated.

TOOLS:

[3] Driver	**07749-0010000**
[4] Attachment, 42 x 47 mm	**07746-0010300**
[5] Pilot, 20 mm	**07746-0040500**

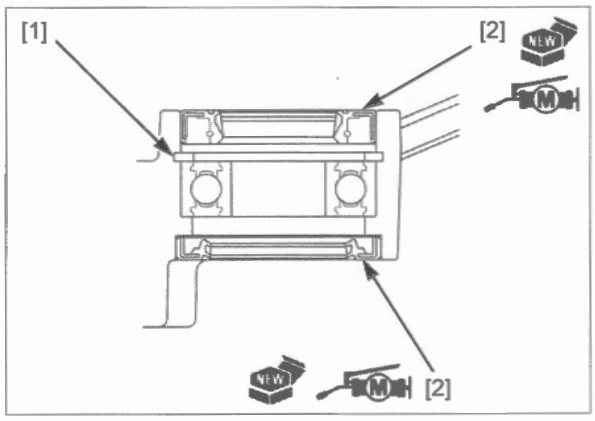


Make sure the snap ring is firmly seated in the groove.

Install the snap ring [1] into the groove properly with the chamfered edge facing down.

Coat the lips of new dust seals with molybdenum disulfide grease.

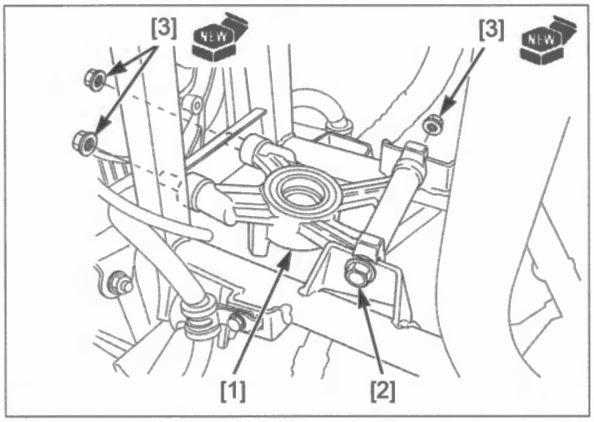
Install each dust seal [2] with the flat side facing out so that it is flush with the bearing holder edge.



INSTALLATION

Temporarily install the following:

- lower steering bearing holder [1]
- bolts [2]
- new nuts [3]



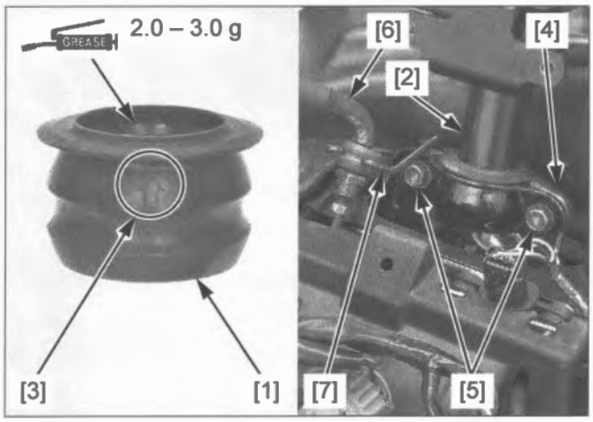
Apply 2.0 – 3.0 g (0.07 – 0.11 oz) of grease to the shaft bushing [1] inner surface.

Install the shaft bushing onto the steering shaft [2] with the arrow mark [3] facing up.
Install the steering shaft into the bearing of the bearing holder.

Install the steering shaft holder [4] and tighten the bolts [5] alternately in several steps to the specified torque.

TORQUE: 32 N·m (3.3 kgf·m, 24 lbf·ft)

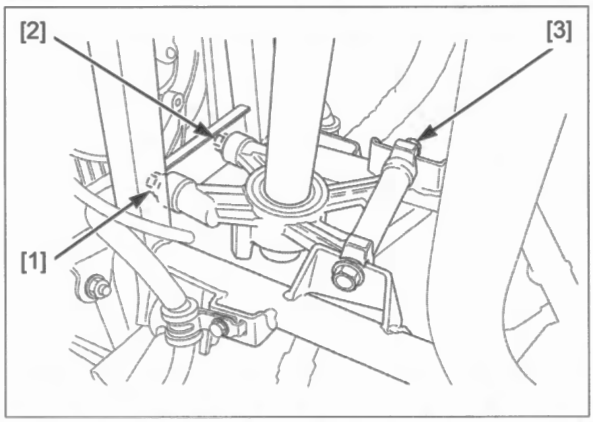
Install the brake hose [6] into the clamp [7].



Tighten the following nut to the specified torque in the specified sequence:

- front left nut [1]
- front right nut [2]
- right nut [3]

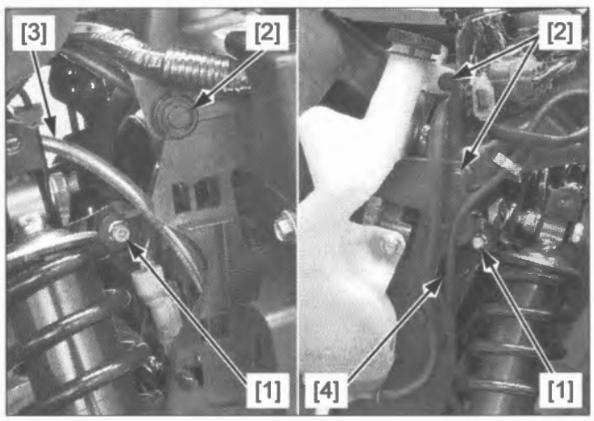
TORQUE: 33.5 N·m (3.4 kgf·m, 25 lbf·ft)



Install the radiator assembly in place by inserting the bosses into the grommets.

Install the following:

- radiator mounting bolts [1]
- three trim clips [2]
- fan motor breather hose [3]
- front final drive breather hose [4]



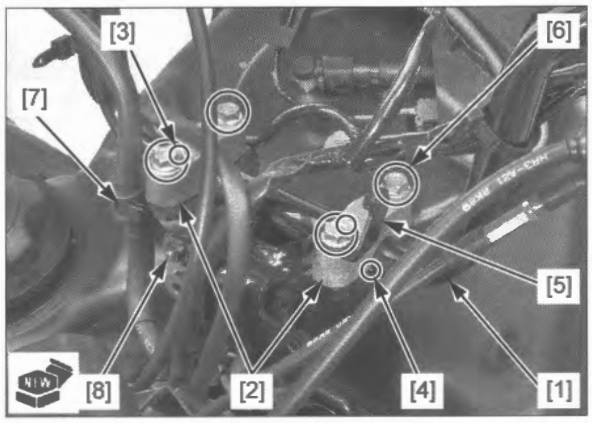
Align the punch mark [4] on the handlebar with the top edge of the lower holder.

Install the handlebar [1] and upper holders [2] with the punch mark [3] facing forward.
Install the stay [5] and tighten the bolts [6] securely.

- Tighten the front bolts first, then tighten the rear bolts.

Install the hose clamp [7] with a new clamp bolt [8] and tighten it to the specified torque.

TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)



Apply molybdenum disulfide grease to the steering shaft spline [1].

Install the steering arm [2] over the steering shaft with the "HR4" mark facing down by aligning the wide tooth with the wide groove.
Install the washer and a new end nut [3], and tighten the nut to the specified torque.

TORQUE: 108 N·m (11.0 kgf·m, 80 lbf·ft)

Install a new cotter pin [4].

Install the tie-rods [5] into the steering arm.

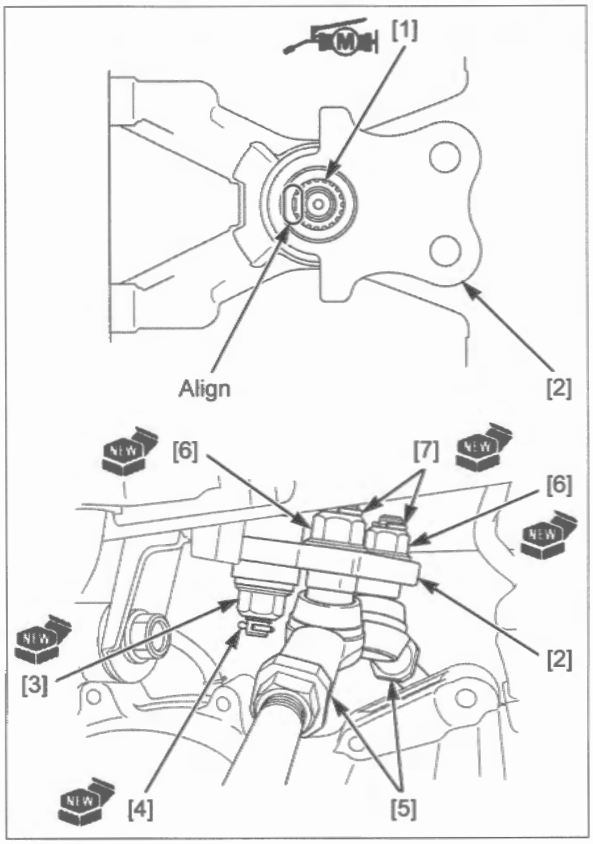
Install new joint nuts [6] and tighten them to the specified torque by holding the joint stud flat surfaces.

TORQUE: 54 N·m (5.5 kgf·m, 40 lbf·ft)

Install new cotter pins [7] into the ball joint studs.

Install the following:

- assist headlight assembly (page 18-7)
- front fender/carrier (page 2-8)



STEERING SHAFT/EPS UNIT (FM2/FM6/FM7/FE2/FA6/FA7)

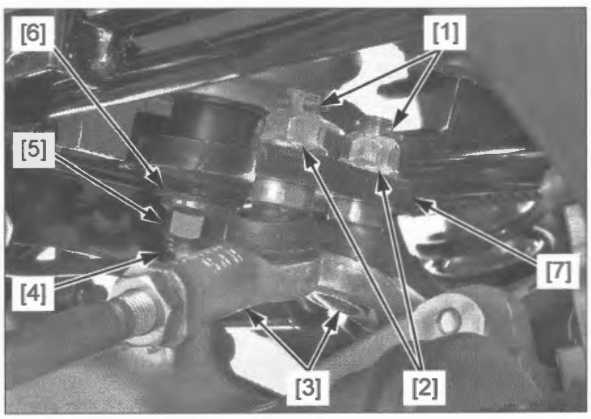
REMOVAL

Remove the following:

- front fender/carrier (page 2-8)
- assist headlight assembly (page 18-6)

Remove the following:

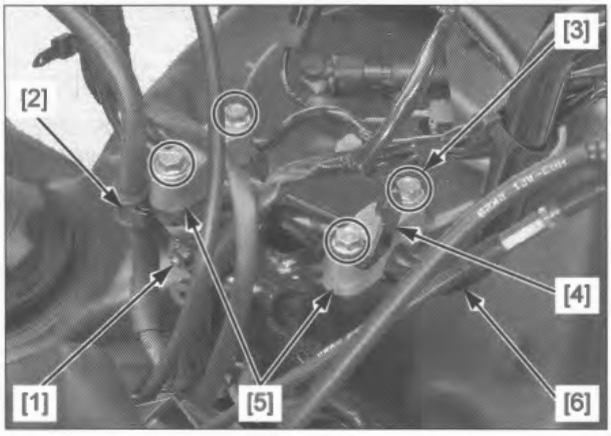
- cotter pins [1] (from the tie-rods)
- joint nuts [2] (by holding the joint stud flat surfaces)
- tie-rods [3] (from the steering arm)
- cotter pin [4] (from the steering shaft)
- shaft end nut [5] and washer [6]
- steering arm [7]



Support the handlebar securely while keeping the master cylinder reservoir upright.

Remove the following:

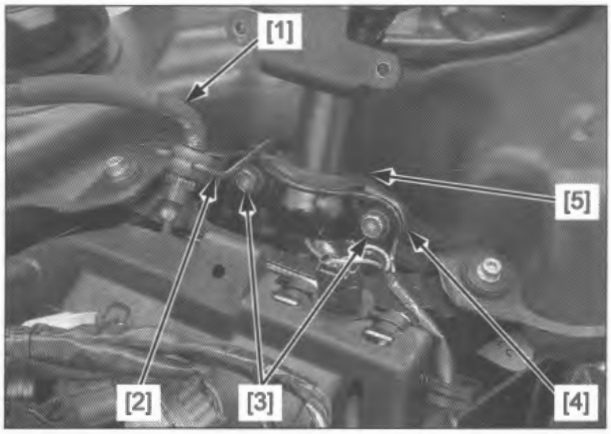
- hose clamp bolt [1]
- hose clamp [2]
- handlebar holder bolts [3]
- stay [4]
- handlebar holders [5]
- handlebar assembly [6] (from the steering shaft)



Release the brake hose [1] from the clamp [2].

Remove the following:

- bolts [3]
- steering shaft holder [4]
- shaft bushing [5]

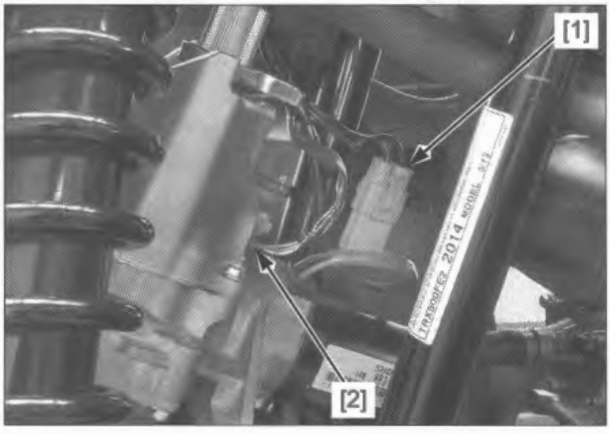


Remove the bolt [1] and steering shaft [2].



Disconnect the following:

- EPS motor 2P (Gray) connector [1]
- torque sensor 3P (Gray) connector [2]

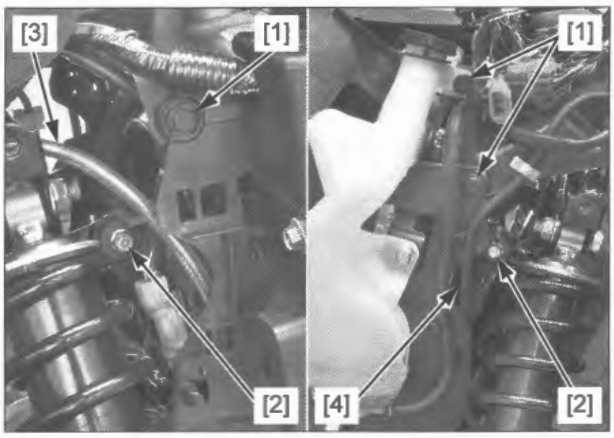


Remove the following:

- three trim clips [1]
- radiator mounting bolts [2]

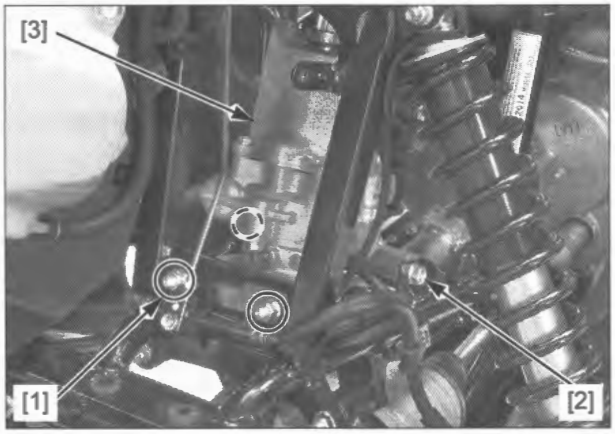
Release the fan motor breather hose [3] and front final drive breather hose [4] from the radiator grille covers.

Remove the radiator mounting bosses from the grommets and move the radiator assembly forward.



Hold the EPS unit securely and maneuver it out of the frame to the left side.

Remove the nuts [1], bolt [2] and EPS unit [3].



INSPECTION

Inspect the following parts for damage, abnormal wear, bends or distortion.

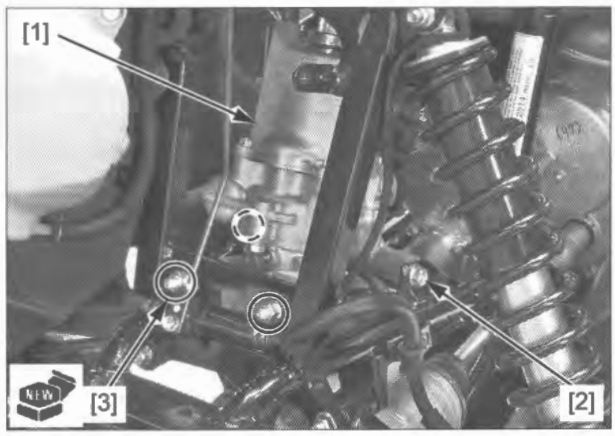
- steering shaft
- shaft bushing
- EPS unit

INSTALLATION

Hold the EPS unit securely and carefully maneuver it into place, being careful not to damage the shaft splines.

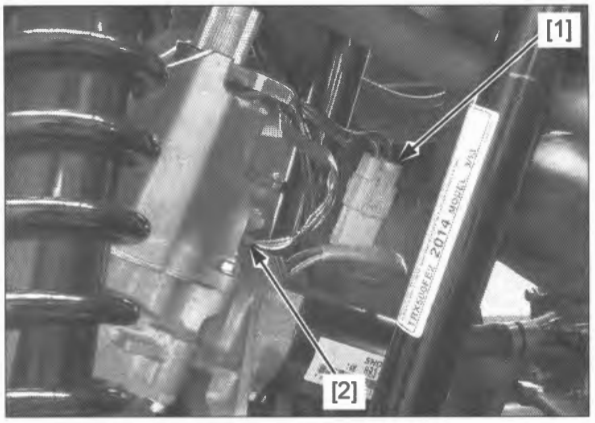
Place the EPS unit [1] into the frame.

Loosely install the mounting bolt [2] from the left side and new nuts [3].



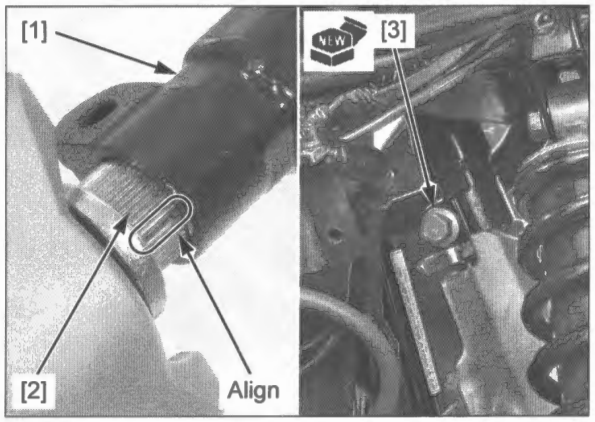
Connect the following:

- EPS motor 2P (Gray) connector [1]
- torque sensor 3P (Gray) connector [2]



Install the steering shaft [1] over the input shaft [2] of the EPS unit by aligning the wide tooth with the wide groove.

Loosely install a new steering shaft pinch bolt [3].



Apply 2.0 – 3.0 g (0.07 – 0.11 oz) of grease to the shaft bushing [1] inner surface.

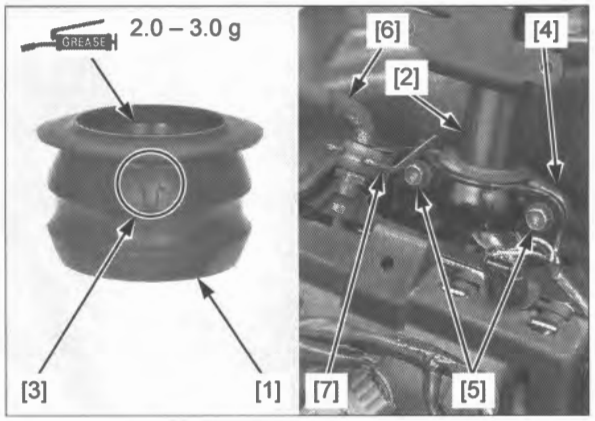
Install the shaft bushing onto the steering shaft [2] with the arrow mark [3] facing up.
Install the steering shaft holder [4] and loosely install the bolts [5].

Be sure the steering shaft is fully seated onto the EPS unit. Tighten the steering shaft pinch bolt to the specified torque.

TORQUE: 60 N·m (6.1 kgf·m, 44 lbf·ft)

Tighten the steering shaft holder bolts alternately in several steps to the specified torque.

TORQUE: 32 N·m (3.3 kgf·m, 24 lbf·ft)

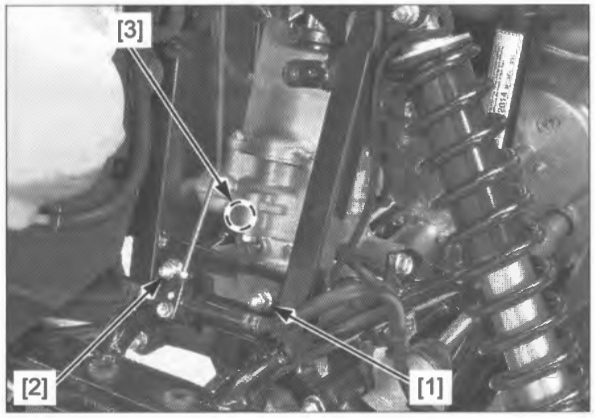


Install the brake hose [6] into the clamp [7].

Tighten the following nut to the specified torque in the specified sequence:

- front left nut [1]
- front right nut [2]
- right nut [3]

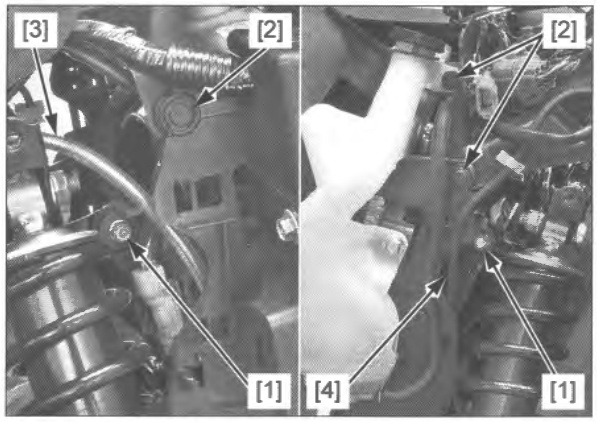
TORQUE: 33.5 N·m (3.4 kgf·m, 25 lbf·ft)



Install the radiator assembly in place by inserting the bosses into the grommets.

Install the following:

– radiator mounting bolts [1]
– three trim clips [2]
– fan motor breather hose [3]
– front final drive breather hose [4]



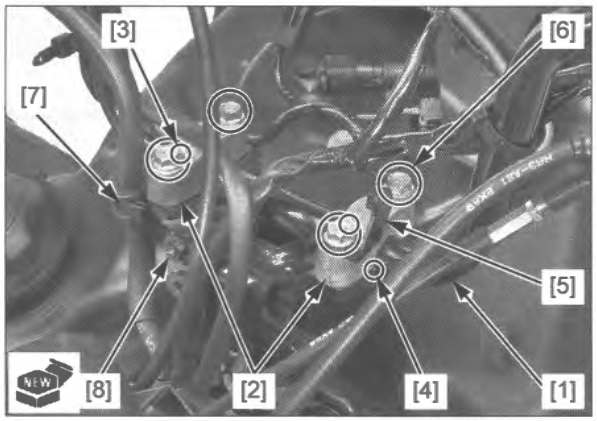
Align the punch mark [4] on the handlebar with the top edge of the lower holder.

Install the handlebar [1] and upper holders [2] with the punch mark [3] facing forward.
Install the stay [5] and tighten the bolts [6] securely.

- Tighten the front bolts first, then tighten the rear bolts.

Install the hose clamp [7] with a new clamp bolt [8] and tighten it to the specified torque.

TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)



Apply molybdenum disulfide grease to the splines.

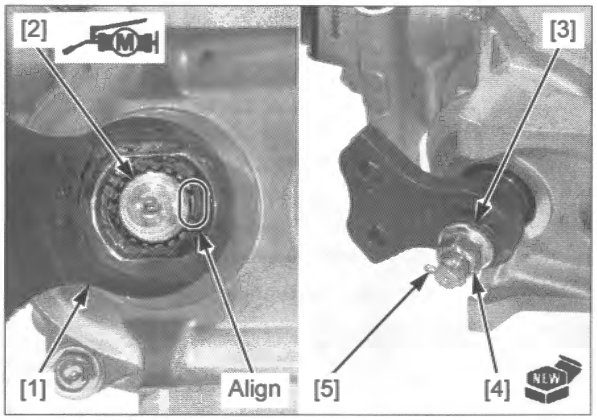
Install the steering arm with the "HR4" mark facing down.

Install the steering arm [1] to the EPS unit output shaft [2] aligning the wide tooth with the wide groove.

Install the washer [3] and tighten a new nut [4] to the specified torque.

TORQUE: 108 N·m (11.0 kgf·m, 80 lbf·ft)

Install a new cotter pin [5].



Install the tie-rods [1] into the steering arm [2].
Install new joint nuts [3] and tighten them to the specified torque by holding the joint stud flat surfaces.

TORQUE: 54 N·m (5.5 kgf·m, 40 lbf·ft)

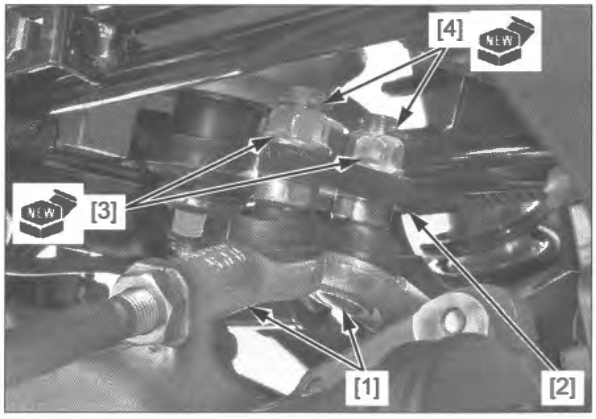
Install new cotter pins [4] into the ball joint studs.

Install the following:

– assist headlight assembly (page 18-7)
– front fender/carrier (page 2-8)

Perform the torque sensor initialization (page 26-9).

- Refer to "Service Information" for service location of the initialization (page 18-2).



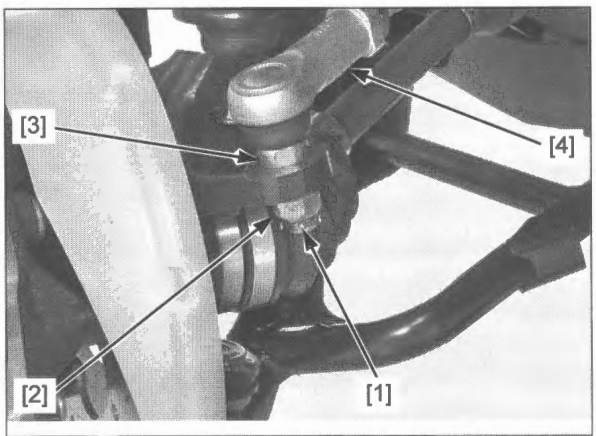
TIE-ROD

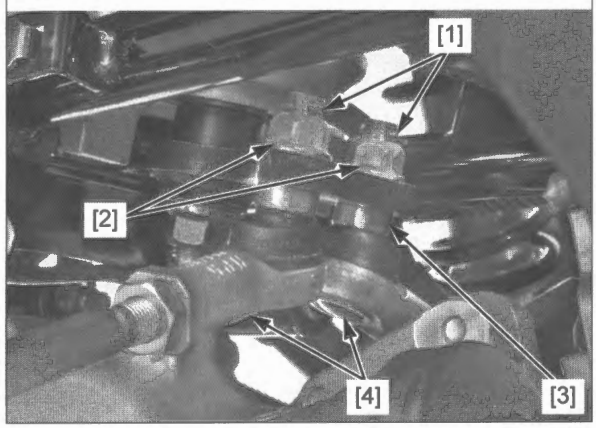
REMOVAL

Remove the front wheel (page 18-11).

Remove the cotter pins [1].

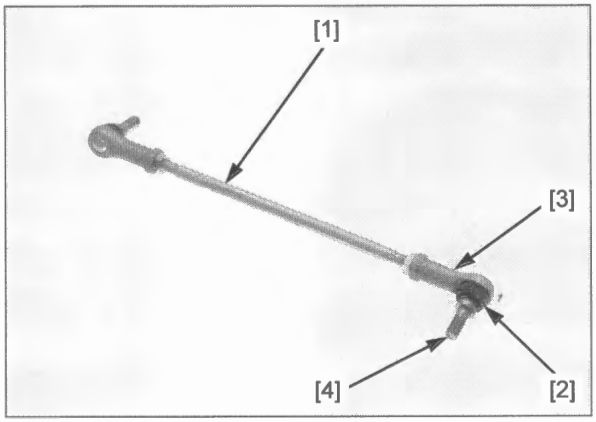
Remove the joint nuts [2] by holding the joint stud flat surfaces [3] with an open end wrench.
Remove the tie-rod [4] from the steering arm and knuckle.





INSPECTION

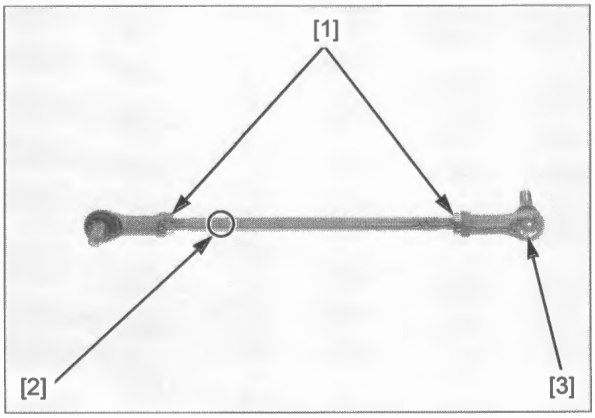
Inspect the tie-rod [1] for distortion or damage.
Inspect the ball joint boots [2] for tears or other damage and the ball joints [3] for looseness by moving the ball joint studs [4].
They should move freely and smoothly without binding.



DISASSEMBLY/ASSEMBLY

Loosen the lock nuts [1], and remove the ball joints and lock nuts from the tie-rod.

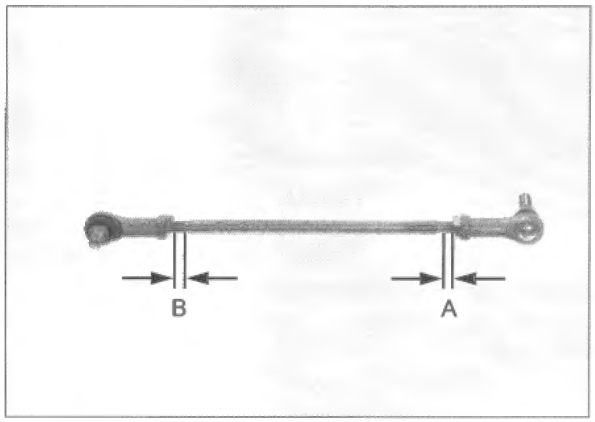
Install the right-hand threads nut and unmarked ball joint on the flat (wrench holding area for toe adjustment) side [2] of the tie-rod, and the left-hand threads nut and "L" marked [3] ball joint on the opposite side.



Note the reference distances (between the lock nut and thread end).

REFERENCE DISTANCES:
A: 7.0 mm (0.28 in)
B: 7.0 mm (0.28 in)

A difference between distances A and B should be 3.0 mm (0.12 in) max.



Tighten these nuts after installing the tie-rod and adjusting the toe.

Temporarily tighten the lock nuts while the ball joint positions are approximately 180° from each other.

INSTALLATION

Install the tie-rods [1] to the steering arm [2] and knuckle [3].

- Install the tie-rod with the flats [4] of the rod toward the knuckle.

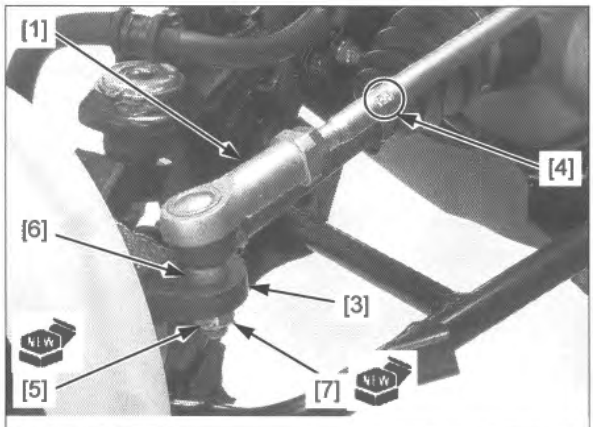
Install new joint nuts [5] and tighten them to the specified torque by holding the joint stud flat surfaces [6].

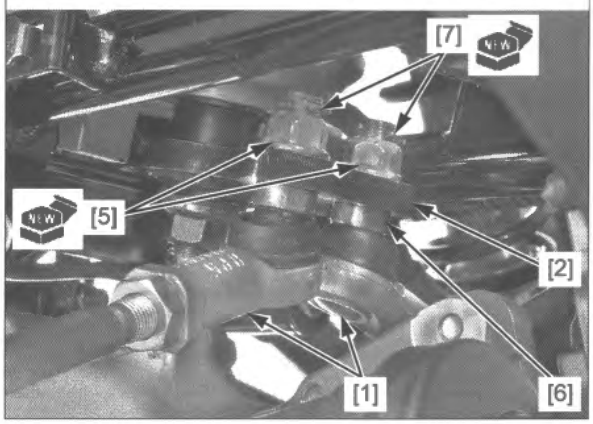
TORQUE: 54 N·m (5.5 kgf·m, 40 lbf·ft)

Install new cotter pins [7].

Install the front wheel (page 18-11).

Adjust the toe (page 3-31).





19. REAR WHEEL/SUSPENSION

SERVICE INFORMATION 19-2

TROUBLESHOOTING 19-3

SYSTEM COMPONENTS 19-4

REAR WHEEL 19-6

REAR SHOCK ABSORBER 19-6

SWINGARM (FM1/FM2/FE1/FE2) 19-9

REAR WHEEL HUB/KNUCKLE (FM5/FM6/FM7/FA5/FA6/FA7) 19-10

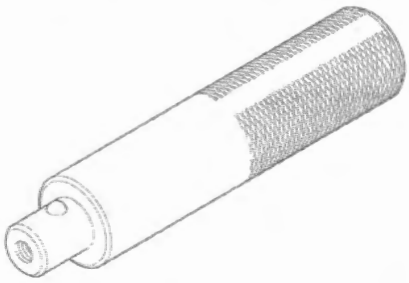
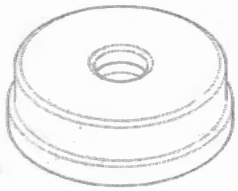
REAR SUSPENSION ARM (FM5/FM6/FM7/FA5/FA6/FA7) 19-13

SERVICE INFORMATION

GENERAL

- This section covers service of the rear wheel, rear shock absorber and swingarm.
- A jack or other support is required to support the vehicle.
- Use Honda Genuine replacement bolts and nuts for all suspension pivots and mounting points.
- For tire information, see Front Wheel/Suspension/Steering section (page 18-11).
- For brake system service, see Brake System section (page 20-4).
- For driving mechanism service, see Rear Driving Mechanism section (page 22-5).

TOOLS

Driver 07749-0010000	Attachment, 62 x 68 mm 07746-0010500
	

TROUBLESHOOTING

FM1/FM2/FE1/FE2:

Rear wheel wobbling
- Bent rim
- Worn or damaged rear axle bearings
- Faulty tire
- Loose wheel hub nut
- Faulty swingarm pivot bushings

Rear wheel hard to turn
- Faulty rear axle bearings
- Bent rear axle
- Rear brake drag

Soft suspension
- Weak shock absorber spring
- Oil leakage from damper unit

Stiff suspension
- Damaged shock absorber damper
- Faulty shock absorber pivot bushings
- Damaged swingarm pivot bushings

Rear suspension noise
- Faulty rear shock absorber
- Loose rear suspension fasteners
- Worn rear suspension pivot bushings

FM5/FM6/FM7/FA5/FA6/FA7:

Rear wheel wobbling
- Bent rim
- Worn or damaged knuckle bearings
- Faulty tire
- Loose wheel hub nut
- Loose rear suspension fasteners

Soft suspension
- Weak shock absorber spring
- Oil leakage from damper unit

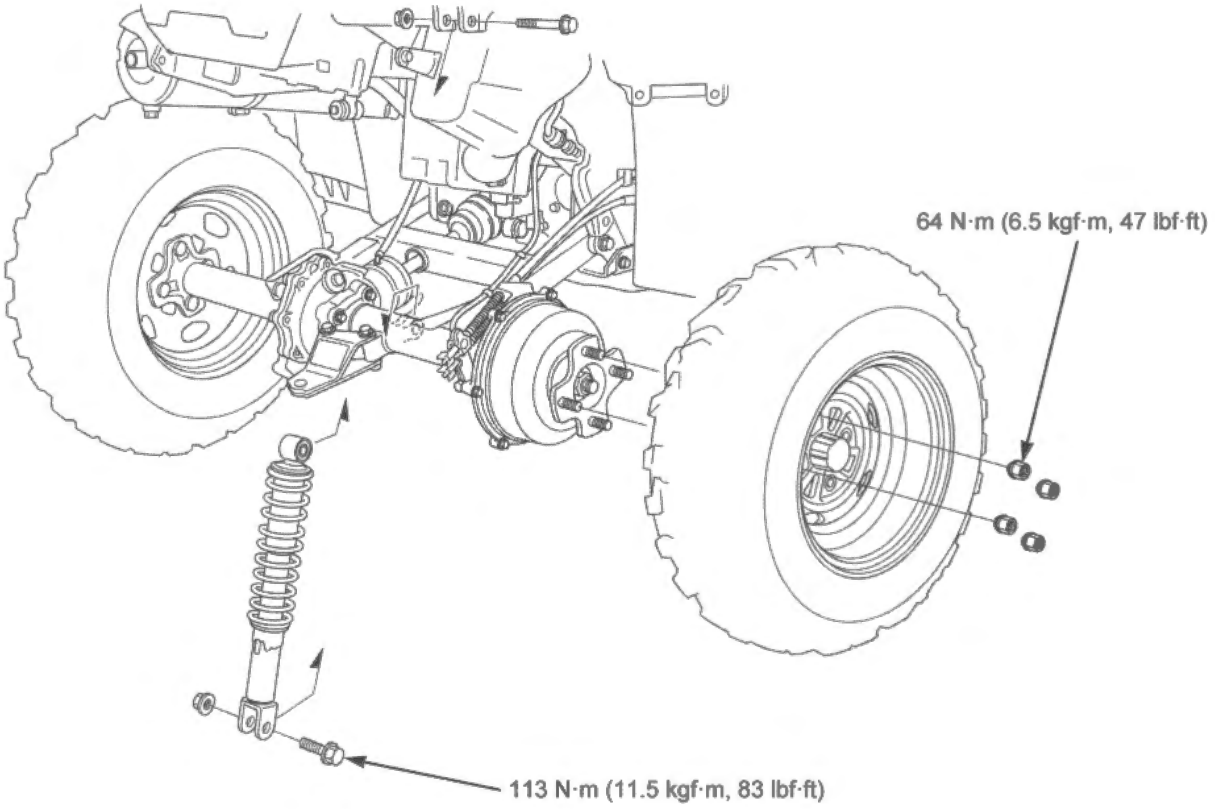
Stiff suspension
- Damaged shock absorber damper
- Faulty shock absorber pivot bushings
- Improperly installed suspension arms
- Faulty suspension arm bushings

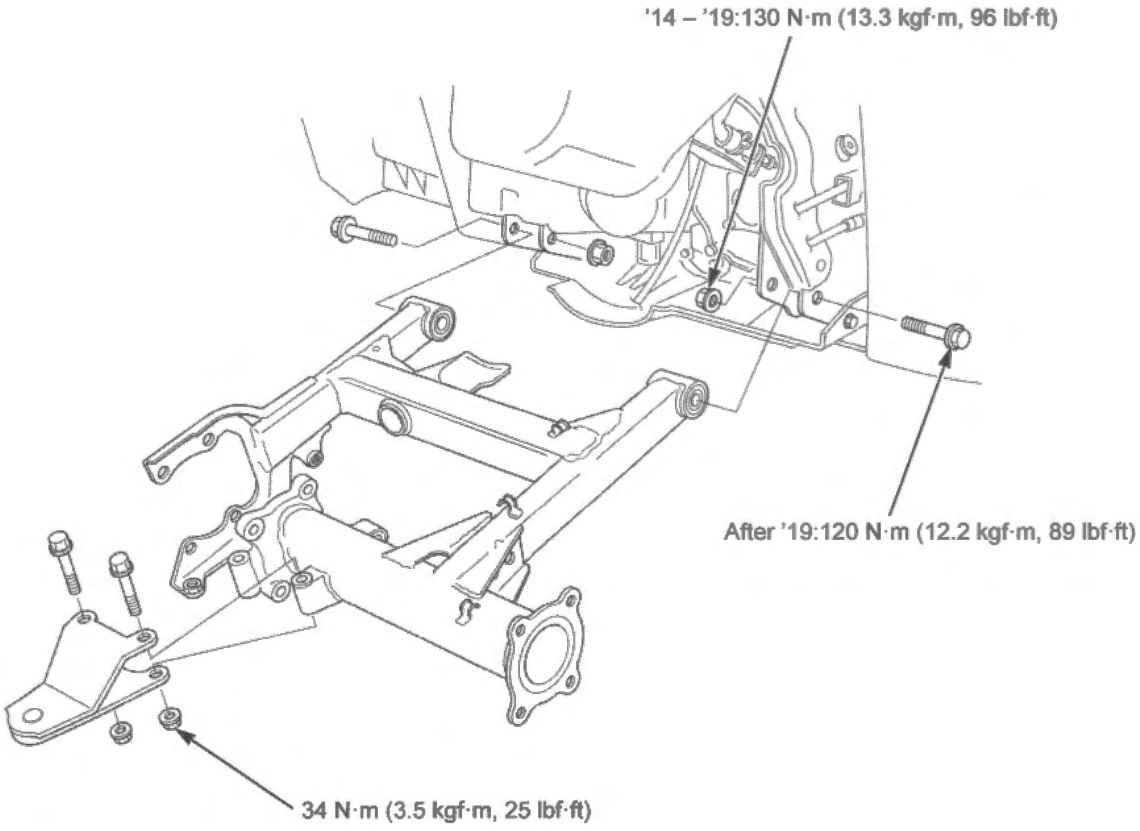
Rear suspension noise
- Faulty rear shock absorber
- Loose rear suspension fasteners
- Worn suspension pivot bushings
- Damaged suspension components

Steers to one side or does not track straight
- Unequal tire pressure
- Bent suspension arm or frame
- Worn or damaged knuckle bearing
- Weak shock absorber

SYSTEM COMPONENTS

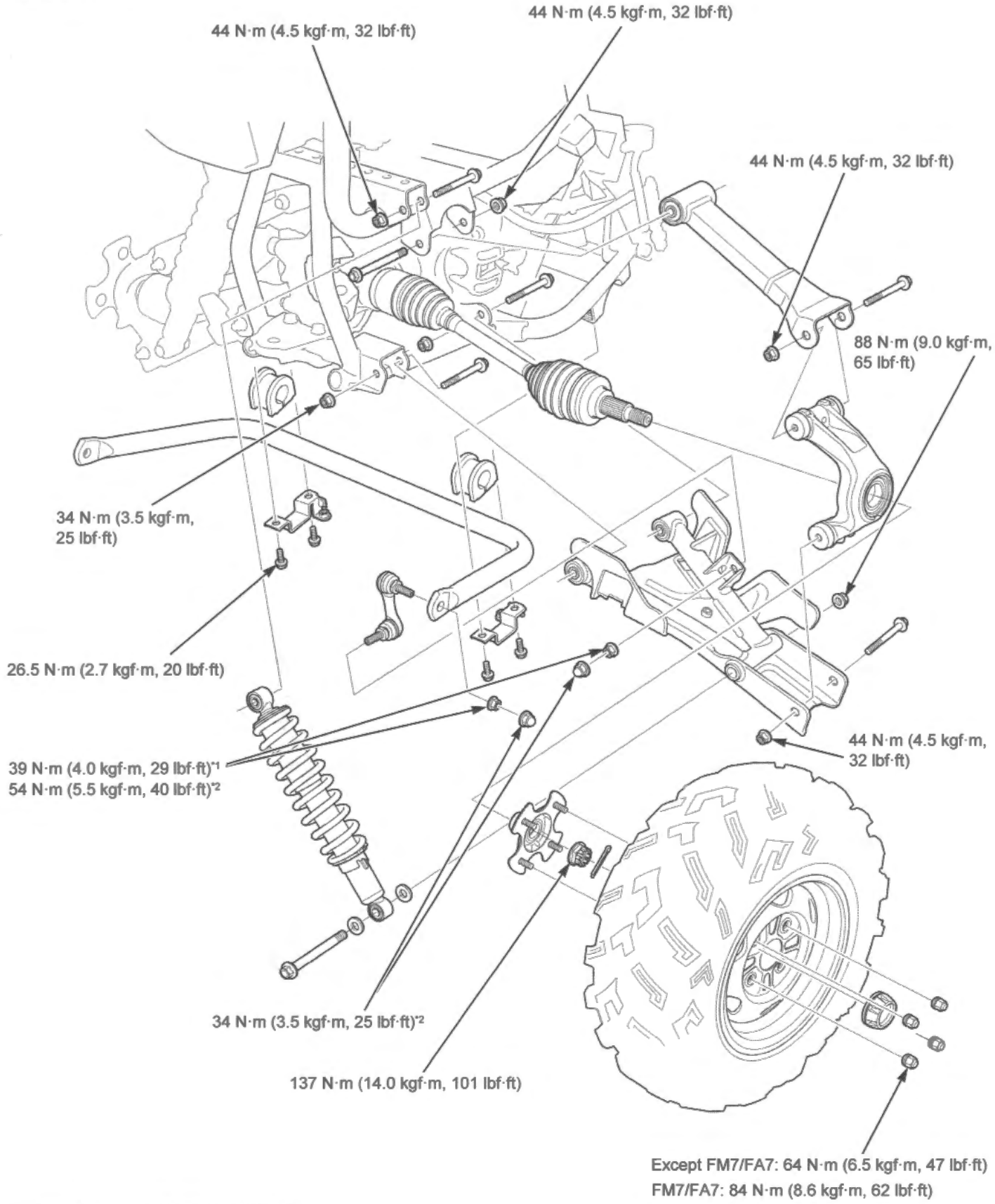
FM1/FM2/FE1/FE2:





FM5/FM6/FM7/FA5/FA6/FA7:

After '23 shown:



*1: Except after '23 FM6/FA5/FA6/FA7
*2: After '23 FM6/FA5/FA6/FA7

REAR WHEEL

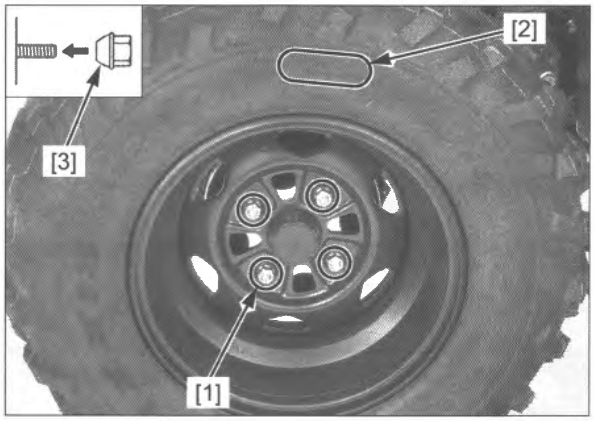
REMOVAL

Loosen the wheel nuts [1].

Support the vehicle using a hoist or equivalent and raise the rear wheels off the ground.

Remove the wheel nuts and rear wheel.

For tire removal/installation and repair, see Front Wheel/Suspension/Steering section (page 18-11).



INSTALLATION

Do not interchange the left and right wheels

Install the rear wheel with the tire valve facing out and the arrow mark [2] facing in the normal rotating direction.

Install the wheel nuts with the tapered side facing inward and tighten them to the specified torque.

TORQUE:
Except FM7/FA7: 64 N·m (6.5 kgf·m, 47 lbf·ft)
FM7/FA7: 84 N·m (8.6 kgf·m, 62 lbf·ft)

REAR SHOCK ABSORBER

REMOVAL/INSTALLATION

FM1/FM2/FE1/FE2:

Remove the seat (page 2-3).

Support the vehicle using a hoist or equivalent and raise the rear wheels off the ground.

Loosen the shock absorber mounting nuts [1] and remove them.

Support the swingarm, and remove the mounting bolts [2] and shock absorber [3].

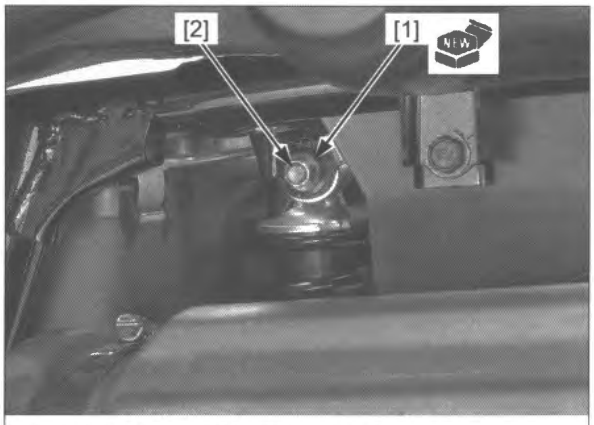
Insert the bolts from the right side.

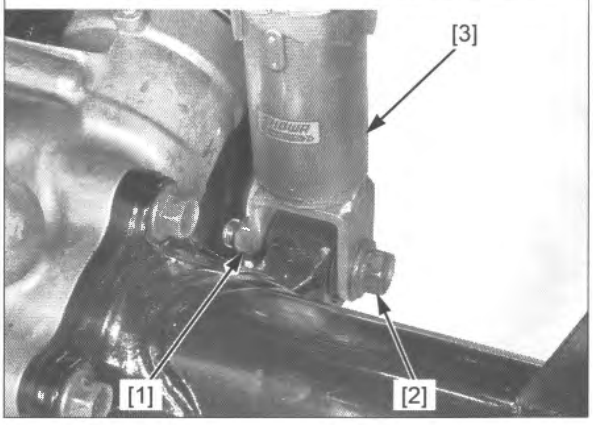
Install the shock absorber with the mounting bolts and nuts.

Tighten the upper mounting nut securely.
Tighten the lower mounting bolt to the specified torque.

TORQUE: 113 N·m (11.5 kgf·m, 83 lbf·ft)

Install the seat (page 2-3).



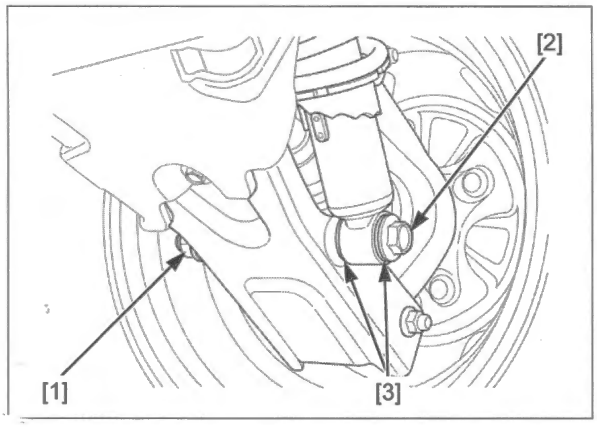


FM5/FM6/FM7/FA5/FA6/FA7:

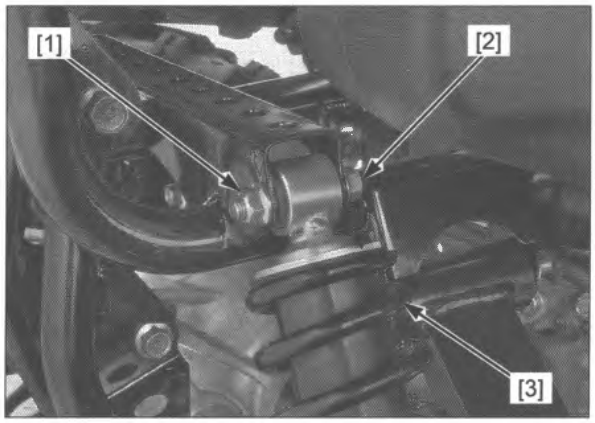
Raise the rear wheel off the ground.

Remove the following:

- lower mounting nut [1]
- mounting bolt [2] and two washers [3]



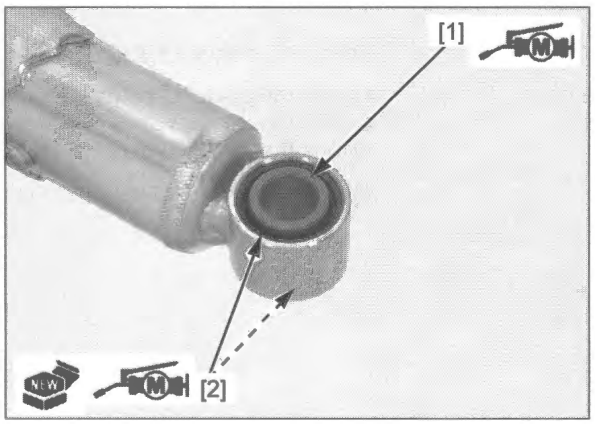
- upper mounting nut [1] and bolt [2]
- rear shock absorber [3]



Remove the pivot collar [1] and dust seals [2].

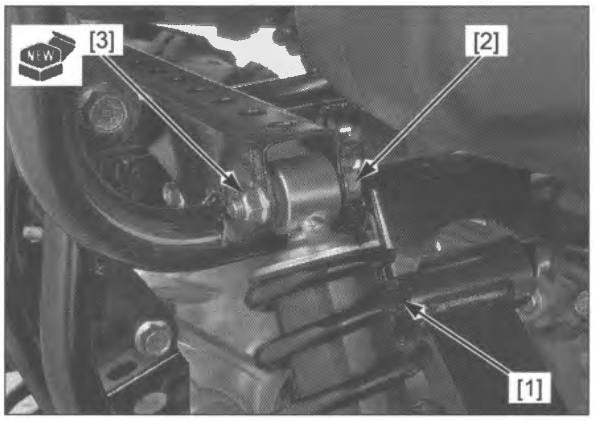
Install new dust seals into the lower pivot with the flat side facing the bushing until they are fully seated.
Apply molybdenum disulfide grease to the lower pivot bushing and dust seal lips.

Install the pivot collar.



Insert the bolt from the front side.

Install the shock absorber [1] with the mounting bolt [2] and a new nut [3].



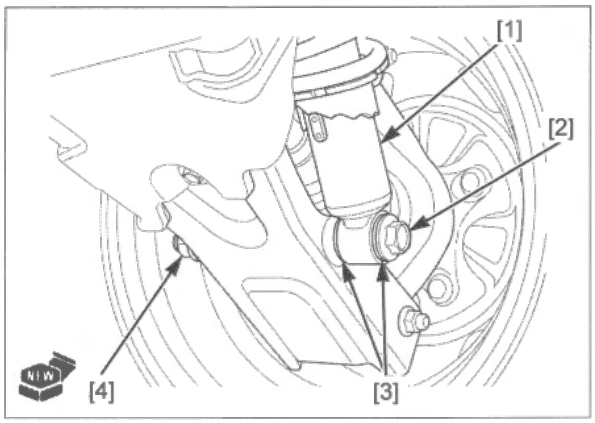
Insert the bolt from the rear side.

Connect the shock absorber [1] to the lower arm with the mounting bolt [2], washers [3] (on both sides of the pivot) and a new nut [4].

Place the vehicle on level ground.

Tighten the mounting nuts to the specified torque.

TORQUE:
Upper: 44 N·m (4.5 kgf·m, 32 lbf·ft)
Lower: 88 N·m (9.0 kgf·m, 65 lbf·ft)



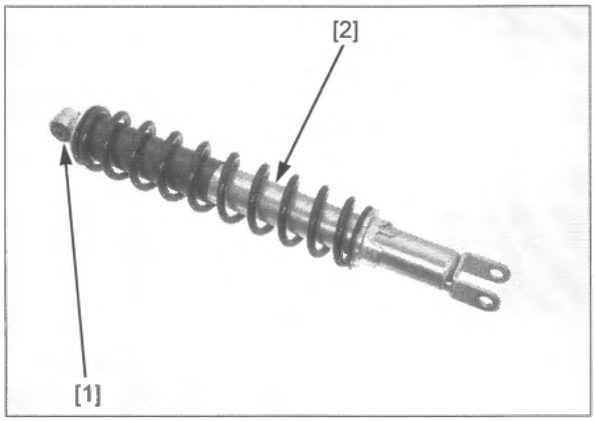
INSPECTION

FM1/FM2/FE1/FE2:

Check the pivot bushing [1] for wear or damage.

Check the damper unit [2] for leakage or other damage.

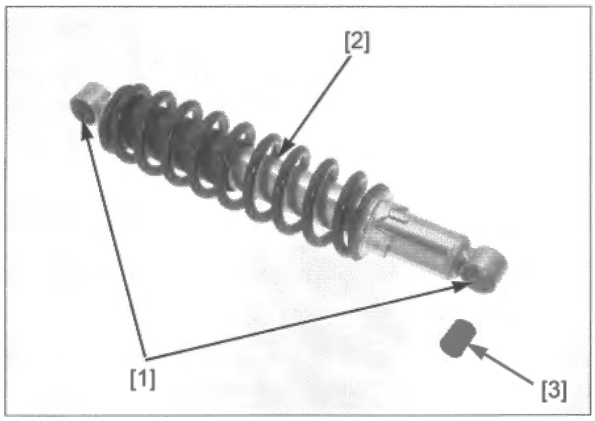
Replace the shock absorber assembly if necessary.



FM5/FM6/FM7/FA5/FA6/FA7:

Check the pivot bushings [1] for wear or damage.
Check the damper unit [2] for leaks or other damage.
Check the lower pivot collar [3] for wear or damage.

Replace the shock absorber assembly if necessary.

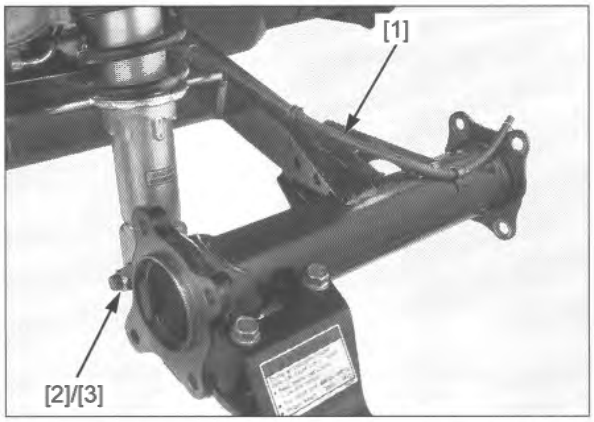


SWINGARM (FM1/FM2/FE1/FE2)

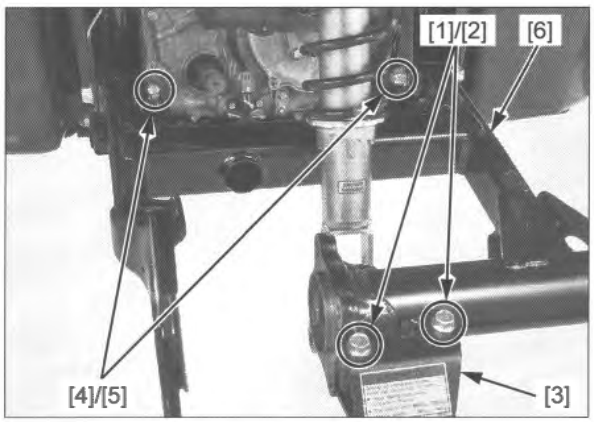
REMOVAL

Remove the following:

- final drive assembly (page 22-19)
- brake panel breather hose [1] (from the clamps)
- shock absorber lower mounting bolt [2] and nut [3]



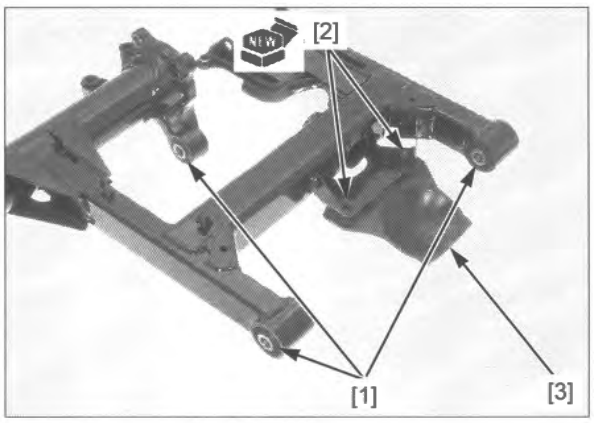
- two nuts [1], bolts [2] and trailer hitch [3]
- two pivot nuts [4], bolts [5] and swingarm [6]



Check the pivot bushings [1] for wear or damage.

Remove the bolt [2] and universal joint guard [3] if necessary.

- Always replace the universal joint guard bolt with a new one.



INSTALLATION

Insert the bolts from the outside.

Install the swingarm [1] with the pivot bolts [2] and new nuts [3].

'15 – '19:

Tighten nuts to the specified torque.

TORQUE: 130 N·m (13.3 kgf·m, 96 lbf·ft)

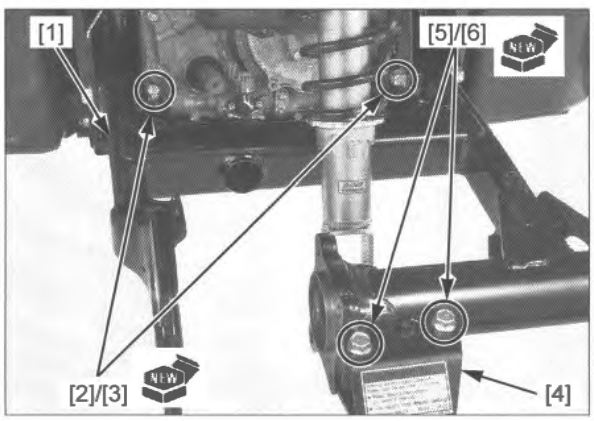
After '19:

Tighten bolts to the specified torque.

TORQUE: 120 N·m (12.2 kgf·m, 89 lbf·ft)

Install the trailer hitch [4] with the bolts [5] and new nuts [6], and tighten the nuts to the specified torque.

TORQUE: 34 N·m (3.5 kgf·m, 25 lbf·ft)

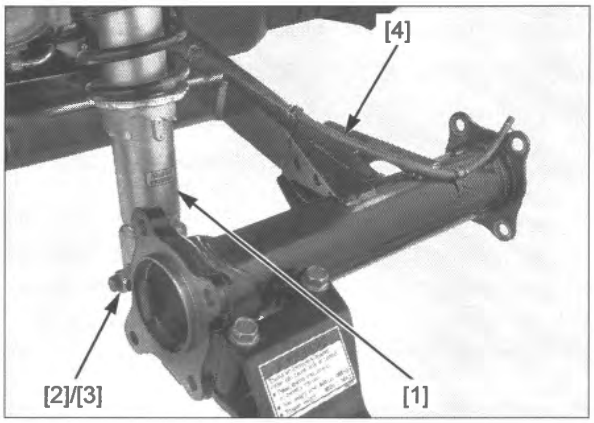


Install the shock absorber [1], lower mounting bolt [2] and nut [3], and tighten the bolt to the specified torque.

TORQUE: 113 N·m (11.5 kgf·m, 83 lbf·ft)

Install the brake panel breather hose [4] into the clamps.

Install the final drive assembly (page 22-31).

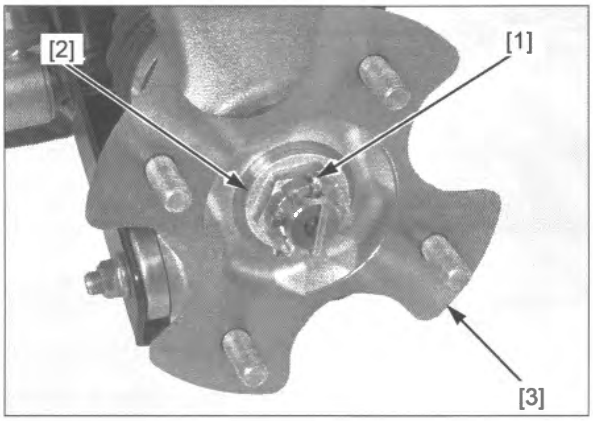


REAR WHEEL HUB/KNUCKLE (FM5/FM6/FM7/FA5/FA6/FA7)

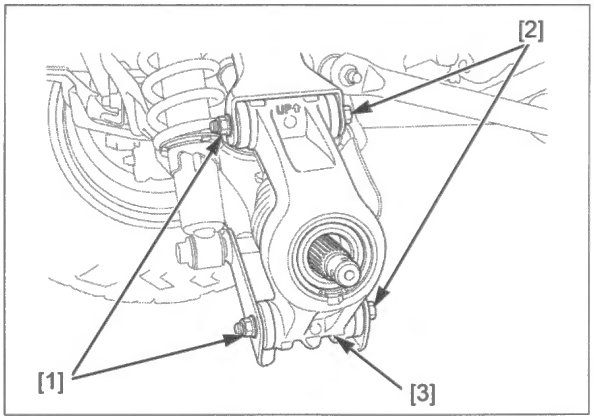
REMOVAL

Remove the following:

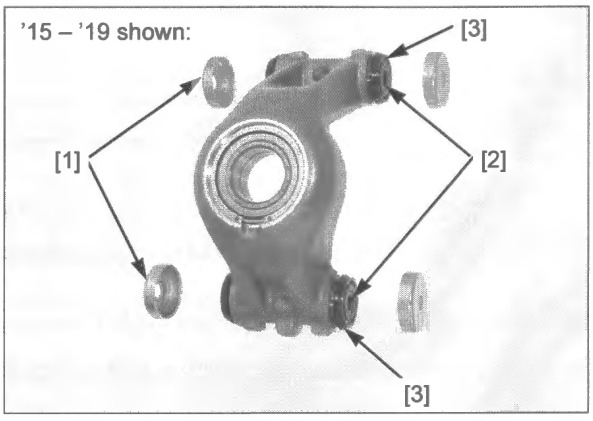
- rear wheel (page 19-6)
- cotter pin [1]
- hub nut [2]
- wheel hub [3]



- pivot nuts [1] and bolts [2]
- knuckle [3]



- seal caps [1]
- pivot collars [2]
- dust seals [3]

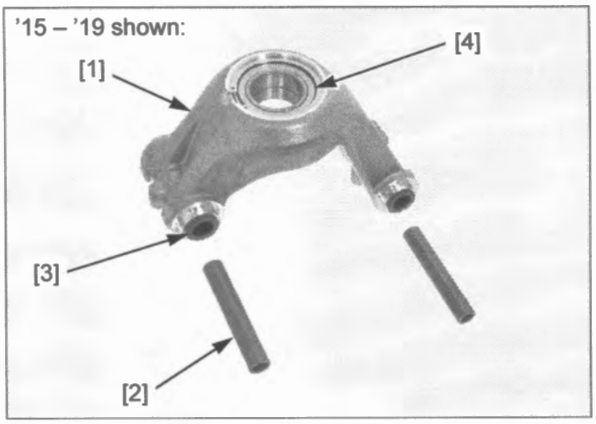


INSPECTION

Check the knuckle [1] for damage or cracks.

Check the pivot collars [2] and bushings [3] for wear or damage.

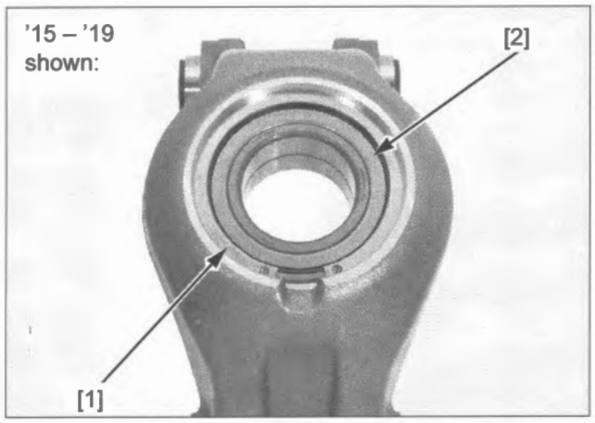
Turn the inner race of the bearing [4] in the knuckle with your finger. The bearing should turn smoothly and quietly. Also check that the bearing outer race fits tightly in the knuckle.



BEARING REPLACEMENT

Remove the snap ring [1].

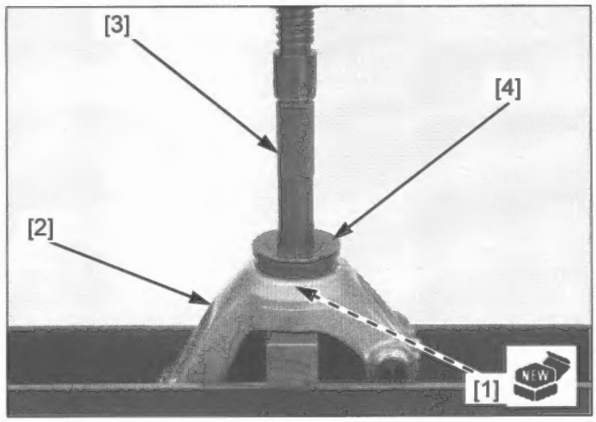
Press the bearing [2] out of the knuckle using a suitable collar.



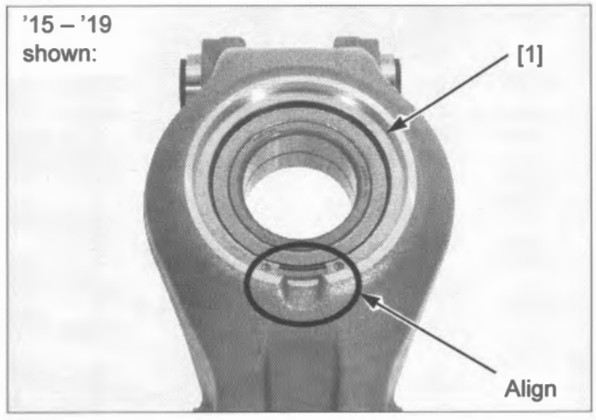
Carefully press a new bearing [1] in the knuckle [2] with the marking side facing up until it is fully seated.

TOOLS:

[3] Driver	**07749-0010000**
[4] Attachment, 62 x 68 mm	**07746-0010500**



Install the snap ring [1] into the knuckle with the chamfered edge facing in while aligning its open end with the knuckle groove.

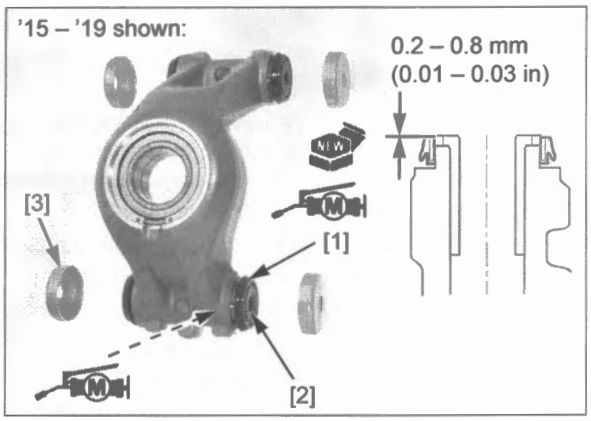


INSTALLATION

Install new dust seals [1] onto the knuckle pivot as specified and apply molybdenum disulfide grease to the seal lips.

Apply molybdenum disulfide grease to the bushing-to-pivot collar contacting surfaces.
Install the pivot collars [2] into the knuckle.

Install the dust seal caps [3] onto the knuckle.

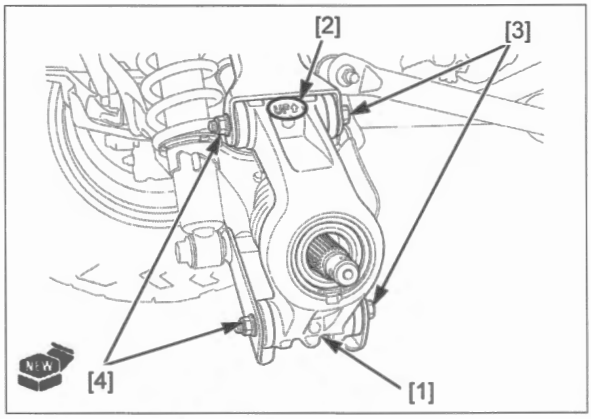


Install the knuckle [1] with its "UP" mark [2] facing up.

Insert the bolt from the front side.

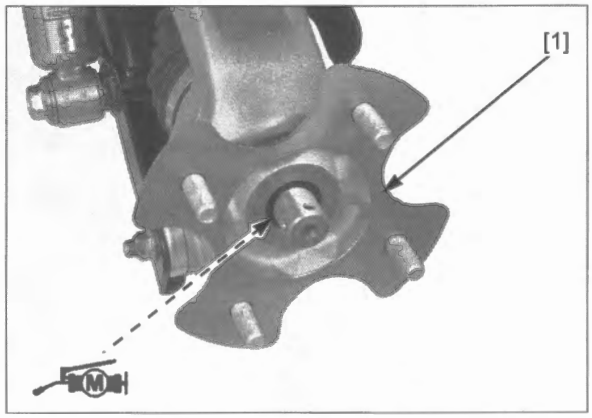
Install the pivot bolts [3] and new nuts [4] and tighten them.

TORQUE: 44 N·m (4.5 kgf·m, 32 lbf·ft)



Apply molybdenum disulfide grease to the drive shaft splines.

Install the wheel hub [1].



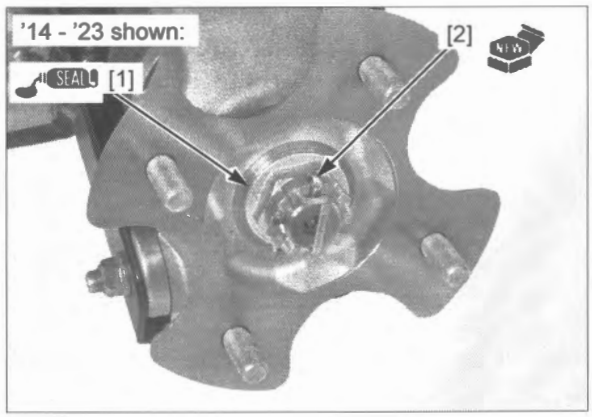
Apply sealant to the wheel hub nut [1] threads (page 1-17).

Install the wheel hub nut.
Apply rear brake and tighten the hub nut to the specified torque and further tighten until its grooves align with the cotter pin hole.

TORQUE: 137 N·m (14.0 kgf·m, 101 lbf·ft)

Install a new cotter pin [2].

Install the rear wheel (page 19-6).



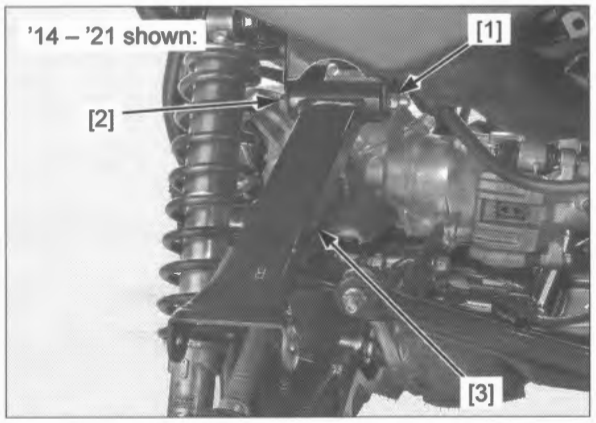
REAR SUSPENSION ARM (FM5/FM6/ FM7/FA5/FA6/FA7)

REMOVAL

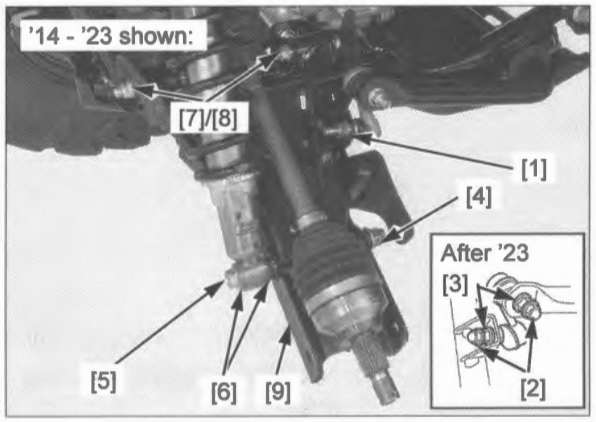
UPPER AND LOWER ARMS

Remove the following:

- wheel hub and knuckle (page 19-10)
- pivot nut [1] and bolt [2]
- upper arm [3]



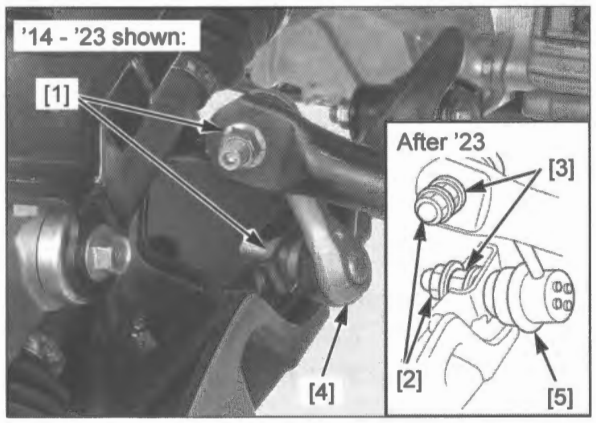
- stabilizer link nut [1] ('14 - '23. to disconnect the link)
- stabilizer link cap nut [2] (after '23)
- stabilizer link flange nut [3] (after '23. to disconnect the link)
- shock absorber lower mounting nut [4] and bolt [5]
- washers [6]
- lower arm pivot nuts [7] and bolts [8]
- lower arm [9]



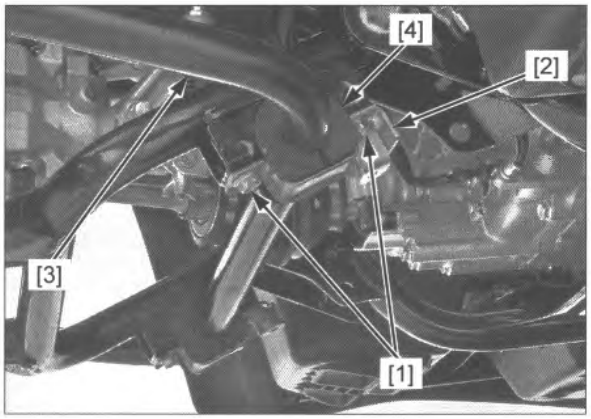
STABILIZER ARM AND LINK

Remove the following:

- skid plate (page 2-16)
- link nuts [1] ('14 - '23)
- cap nuts [2] (after '23)
- flange nuts [3] (after '23)
- stabilizer links [4] ('14 - '23)
- stabilizer links [5] (after '23)



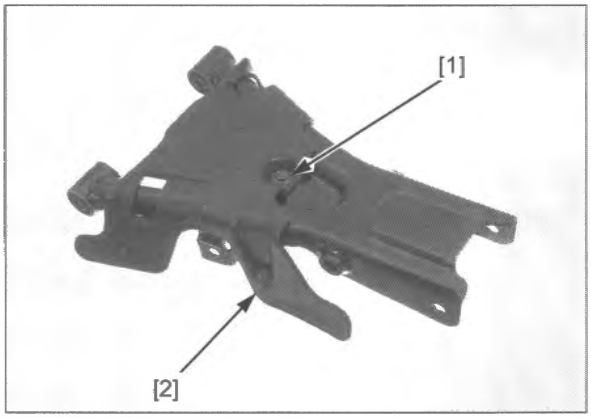
– four bolts [1] and arm holders [2]
– stabilizer arm [3]
– stabilizer bushings [4]



INSPECTION

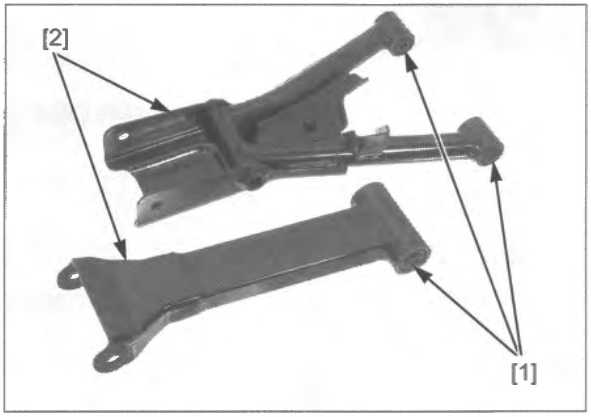
SUSPENSION ARMS

Remove the bolt [1] and lower arm guard [2].



Check the pivot bushings [1] for wear or damage.

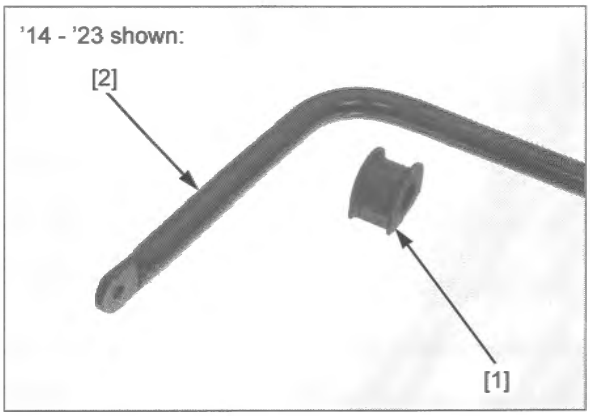
Check the suspension arms [2] for distortion or damage.



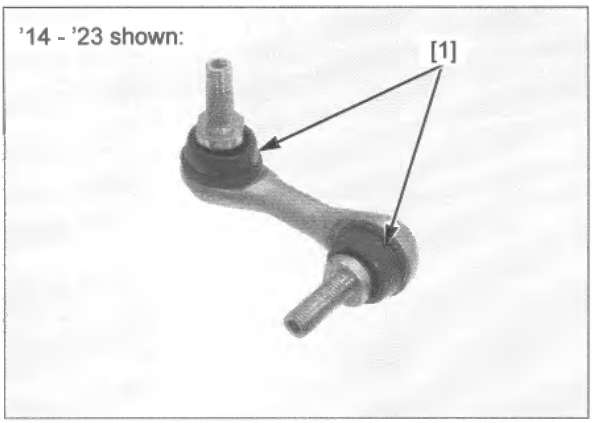
STABILIZER ARM AND LINK

Check the stabilizer bushings [1] for wear or damage.

Check the stabilizer arm [2] for distortion or damage.



Inspect the ball joint boot [1] of the link for tears or other damage.

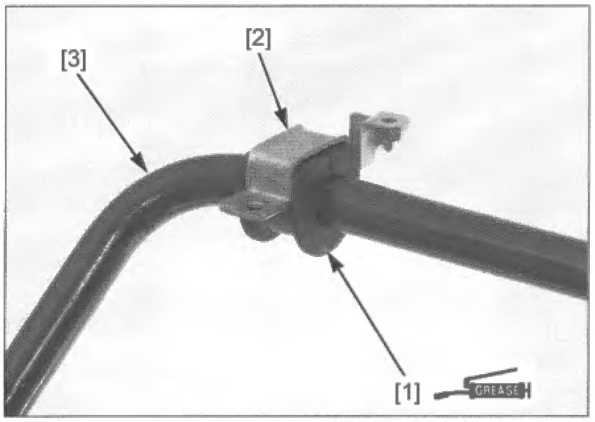


INSTALLATION

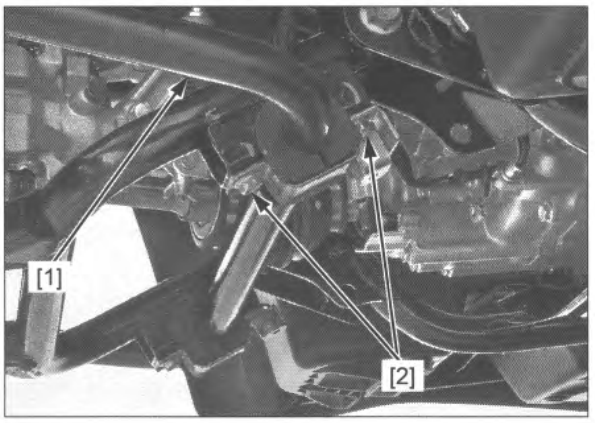
STABILIZER ARM AND LINK

Apply grease to the arm contacting surfaces of the bushings [1].

Install the bushings and arm holders [2] onto the stabilizer arm [3] with the weld nut on the holder facing the inside as shown.



Install the stabilizer arm assembly [1] onto the frame with the four bolts [2].



'14 - '23

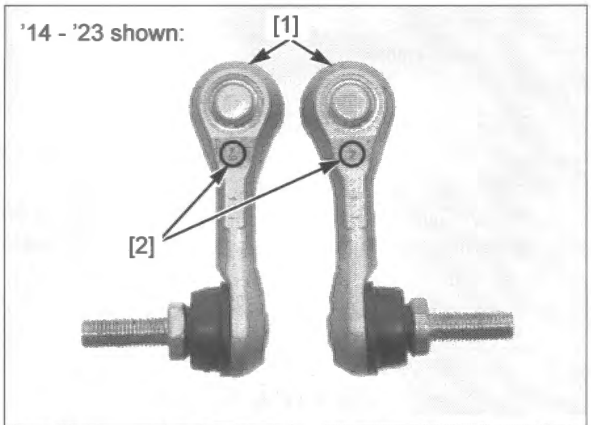
Install each stabilizer link [1] into the stabilizer arm and lower arm with its identification mark [2] facing down.

- "R" mark: right link
- "L" mark: left link

Install new nuts [3] and tighten the following fastener to the specified torque.

TORQUE:
Stabilizer arm holder bolt:
26.5 N·m (2.7 kgf·m, 20 lbf·ft)
Stabilizer link nut:
39 N·m (4.0 kgf·m, 29 lbf·ft)

Install the skid plate (page 2-16).



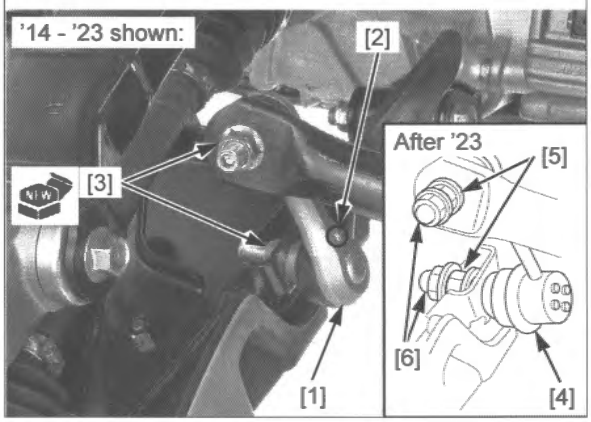
After '23

Install each stabilizer link [4] into the stabilizer arm and lower arm as shown.

Install flange nut [5], cap nuts [6] and tighten the following fastener to the specified torque.

TORQUE:
Stabilizer arm holder bolt:
26.5 N·m (2.7 kgf·m, 20 lbf·ft)
Stabilizer link cap nut:
34 N·m (3.5 kgf·m, 25 lbf·ft)
Stabilizer link flange nut:
54 N·m (5.5 kgf·m, 40 lbf·ft)

Install the skid plate (page 2-16).



LOWER AND UPPER ARMS

Insert the pivot bolts from the front side.

Install the lower arm [1] into the frame with the pivot bolts [2] and new nuts [3], and loosely tighten them.

Insert the mounting bolt from the rear side.

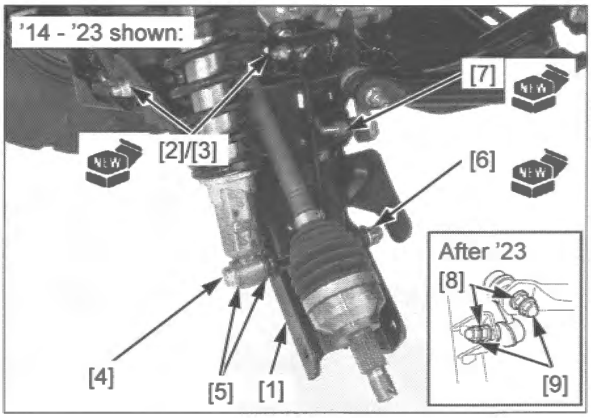
Connect the shock absorber with the lower mounting bolt [4], washers [5] (on both sides of the pivot) and a new nut [6] and tighten it to the specified torque.

TORQUE: 88 N·m (9.0 kgf·m, 65 lbf·ft)

'14 - '23

Connect the stabilizer link with the new nut [7] and tighten it to the specified torque.

TORQUE: 39 N·m (4.0 kgf·m, 29 lbf·ft)



After '22

Connect the stabilizer link with a flange nut [8], cap nut [9] and tighten it to the specified torque.

TORQUE (after '22):
Stabilizer link cap nut:
34 N·m (3.5 kgf·m, 25 lbf·ft)
Stabilizer link flange nut:
54 N·m (5.5 kgf·m, 40 lbf·ft)

Insert the pivot bolt from the rear side.

Install the upper arm [1] into the frame with the pivot bolt [2] and a new nut [3], and loosely tighten them.

Install the knuckle and wheel hub (page 19-12).

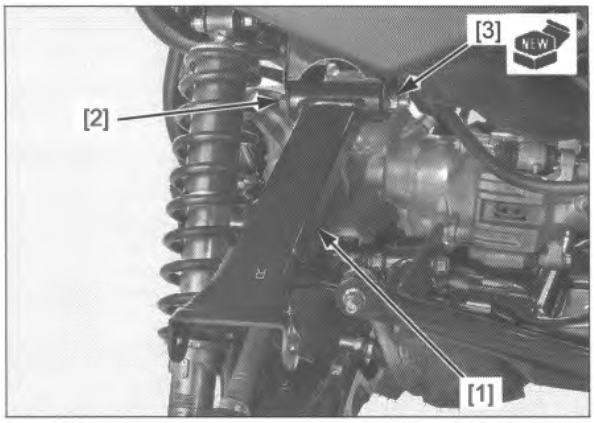
Place the vehicle on a level ground and tighten the following fasteners to the specified torque.

TORQUE:

Upper arm pivot nut (frame side):
44 N·m (4.5 kgf·m, 32 lbf·ft)

Lower arm pivot nut (frame side):
34 N·m (3.5 kgf·m, 25 lbf·ft)

Upper and lower arm pivot nut (knuckle side):
44 N·m (4.5 kgf·m, 32 lbf·ft)



MEMO

20. BRAKE SYSTEM

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AIR BLEEDING 20-7

BRAKE PAD/DISC 20-10

FRONT MASTER CYLINDER 20-12

FRONT BRAKE CALIPER 20-13

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FE1/FE2) 20-16

REAR BRAKE PEDAL (FM1/FM2/FE1/
FE2) 20-20

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PEDAL (FM5/FM6/FM7/FA5/FA6/FA7) 20-21

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REAR BRAKE LEVER (FE2/FA5/FA6/FA7)
(After '19) 20-31

SERVICE INFORMATION

GENERAL

⚠CAUTION

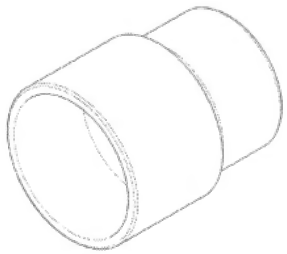
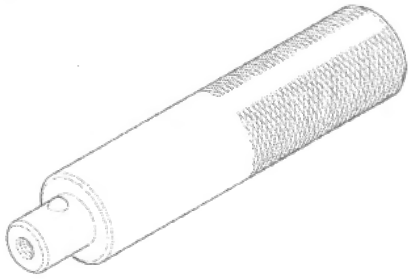
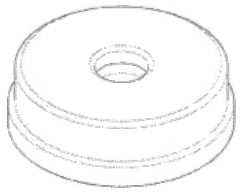
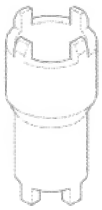
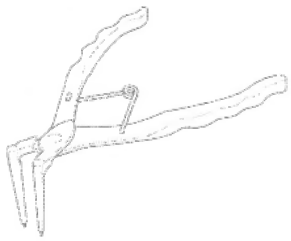
Frequent inhalation of brake pad or brake shoe dust, regardless of material composition could be hazardous to your health.
- Avoid breathing dust particles.
- Never use an air hose or brush to clean brake assemblies. Use an OSHA-approved vacuum cleaner.

NOTICE

Spilled brake fluid will severely damage the plastic parts and painted surfaces. It is also harmful to some rubber parts. Be careful whenever you remove the reservoir cap; make sure the front reservoir is horizontal first.

- A contaminated brake disc, pad, drum or shoe reduces stopping power. Discard contaminated pads or shoes, and clean a contaminated disc or drum with a high quality brake degreasing agent.
- Never allow contaminants (dirt, water, etc.) to get into an open reservoir.
- Once the hydraulic system has been opened, or if the brake feels spongy, the system must be bled.
- Always use fresh DOT 4 brake fluid from a sealed container when servicing the system. Do not mix different types of fluid as they may not be compatible.
- Always check brake operation before riding the vehicle.
- For front brake inhibitor switch servicing, see Lights/Meters/Switches section (page 24-2).

TOOLS

Base Assembly 56 x 66 mm 070MF-MEC0300  Not available in U.S.A.	Driver 07749-0010000 	Attachment, 62 x 68 mm 07746-0010500 
Lock nut wrench, 20 x 24 mm 07716-0020100 	Snap ring pliers 07914-SA50001  or 07914-3230001	

TROUBLESHOOTING

FRONT DISC BRAKE (All models), REAR DISC BRAKE (FM5/FM6/FM7/FA5/FA6/FA7)

Brake lever/pedal soft or spongy
- Air in hydraulic system
- Leaking hydraulic system
- Contaminated brake pad/disc
- Worn caliper piston seal
- Worn master cylinder piston cups
- Worn brake pad/disc
- Contaminated caliper
- Contaminated master cylinder
- Caliper not sliding properly
- Low brake fluid level
- Clogged fluid passage
- Warped/deformed brake disc
- Sticking/worn caliper piston
- Sticking/worn master cylinder piston
- Bent brake lever/pedal

Brake lever/pedal hard
- Clogged/restricted brake system
- Sticking/worn caliper piston
- Sticking/worn master cylinder piston
- Caliper not sliding properly
- Bent brake lever/pedal

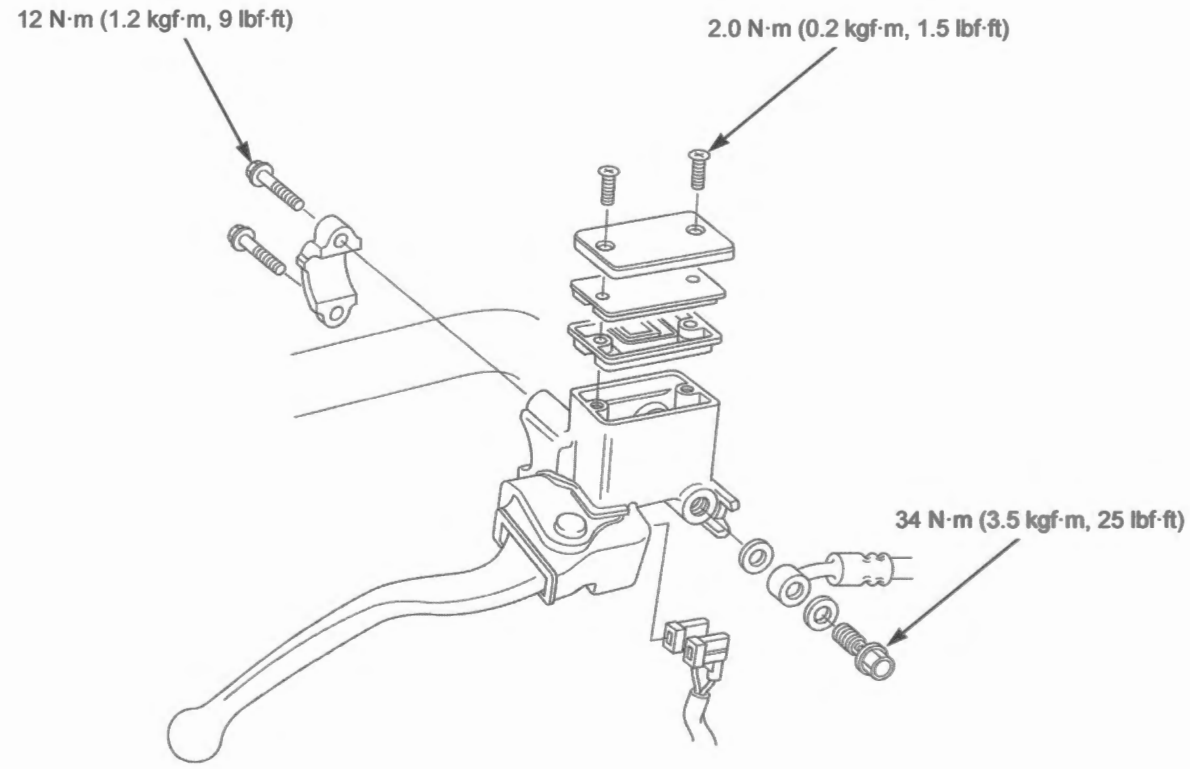
Brake drags
- Contaminated brake pad/disc
- Badly worn brake pad/disc
- Warped/deformed brake disc
- Caliper not sliding properly
- Clogged/restricted fluid passage
- Sticking caliper piston

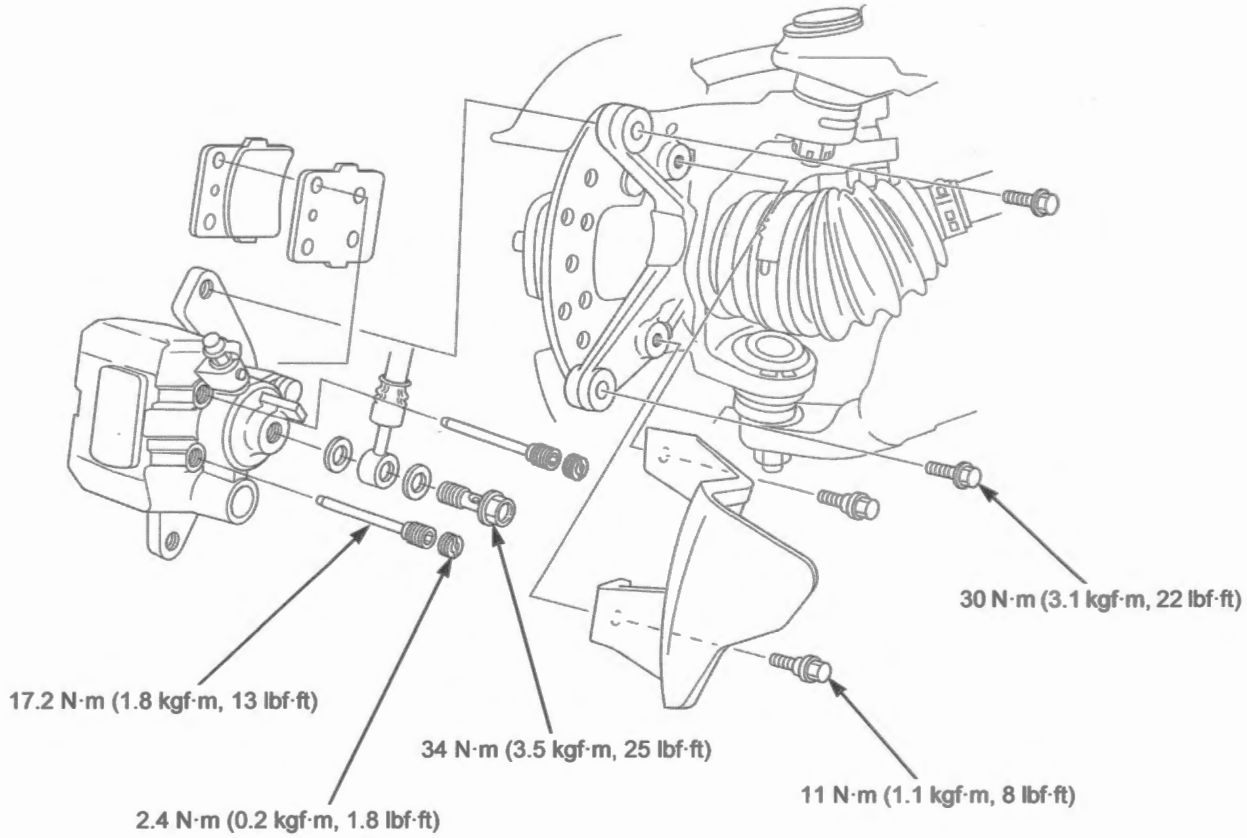
REAR DRUM BRAKE (FM1/FM2/FE1/FE2)

Poor brake performance
- Brake not adjusted properly
- Worn or contaminated brake shoes
- Worn or contaminated brake drum
- Water in brake drum
- Incorrectly installed rear brake arm
- Worn rear brake cam

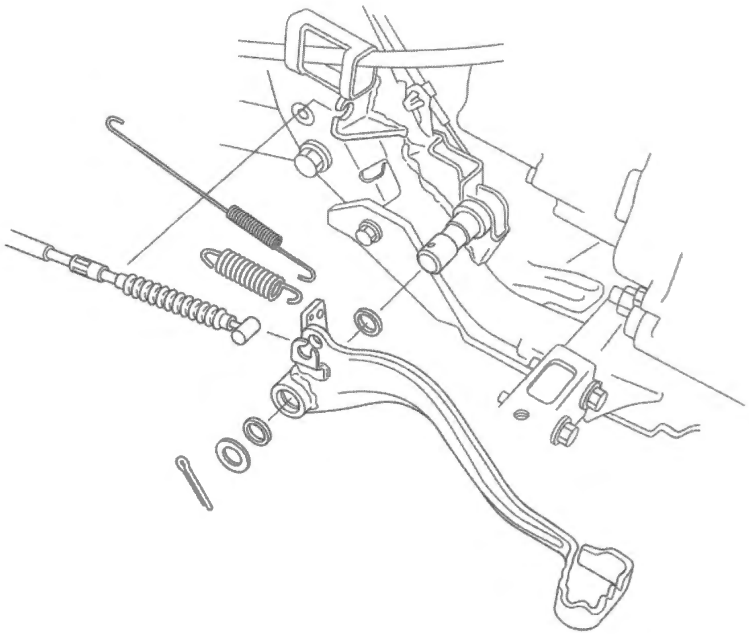
SYSTEM COMPONENTS

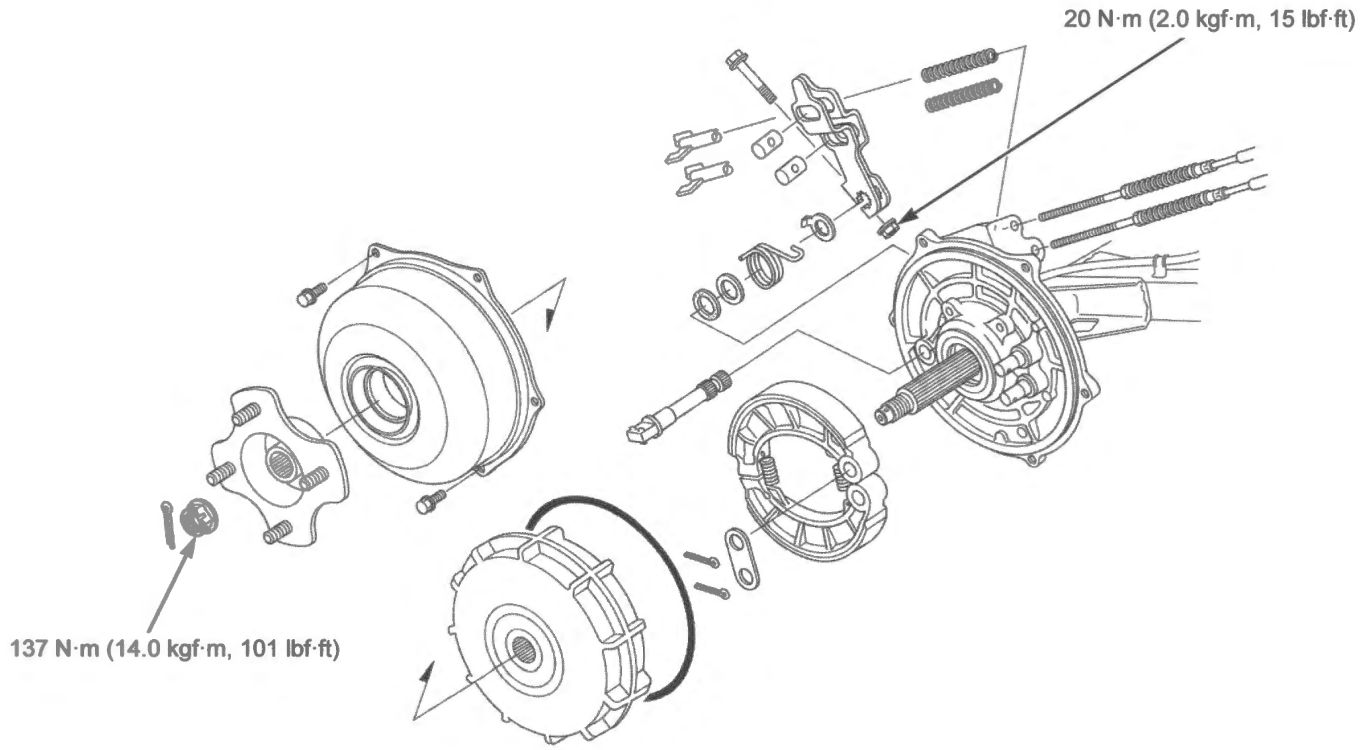
FRONT:



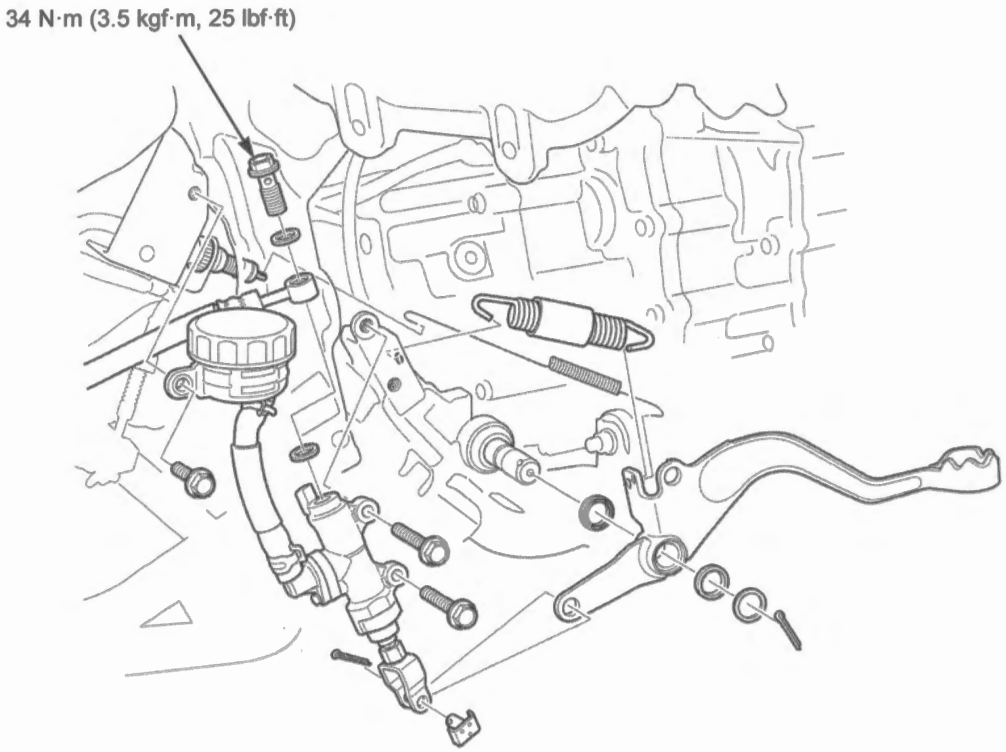


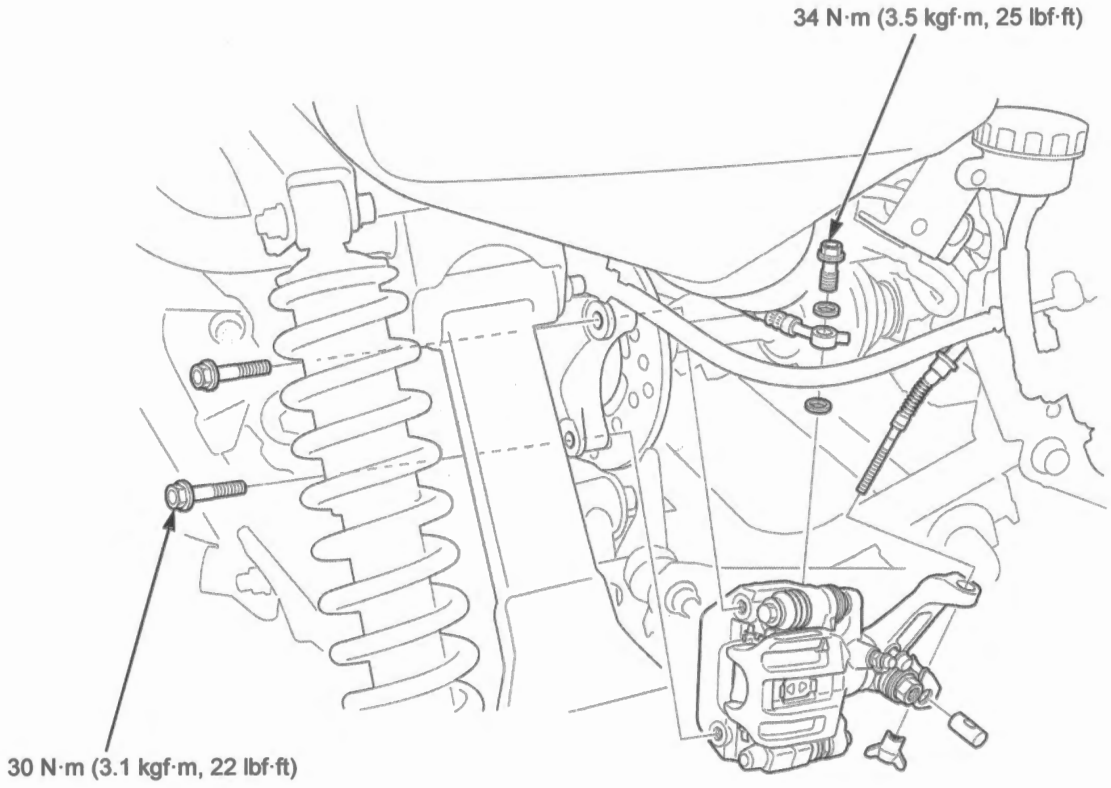
REAR (FM1/FM2/FE1/FE2):





REAR (FM5/FM6/FM7/FA5/FA6/FA7):





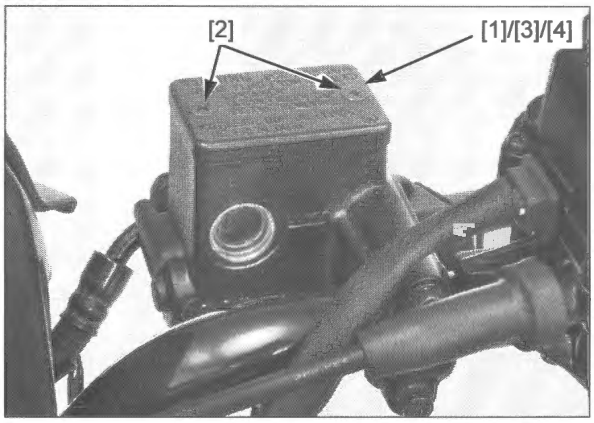
BRAKE FLUID REPLACEMENT/AIR BLEEDING

BRAKE FLUID DRAINING

FRONT BRAKE

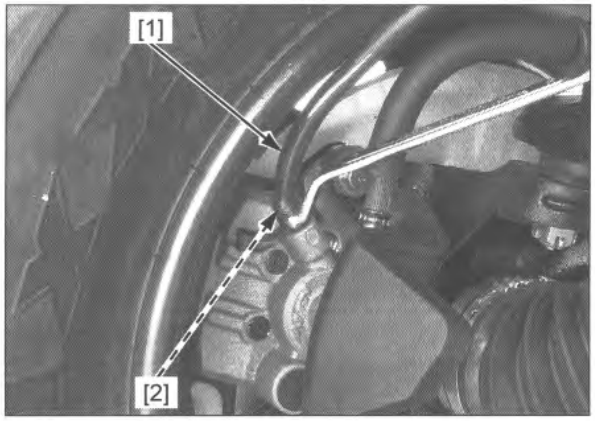
Turn the handlebar to the left until the reservoir is level before removing the reservoir cap [1].

Remove the screws [2], reservoir cap, set plate [3] and diaphragm [4].



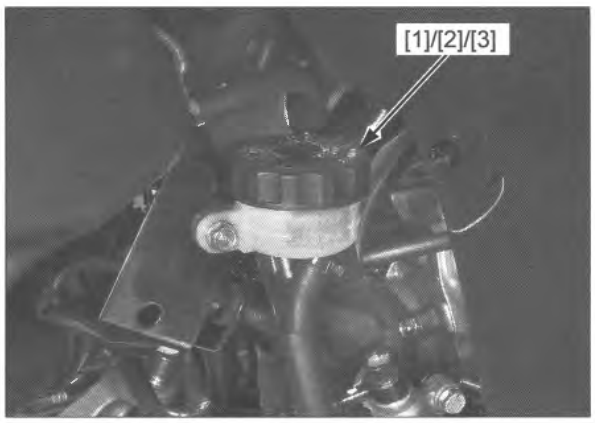
Connect a bleed hose [1] to the front brake caliper bleed valve [2].
Loosen the bleed valve and pump the front brake lever until no more fluid flows out of the bleed valve.
Close each brake caliper bleed valve.

Perform the above procedure for the other side bleed valve.



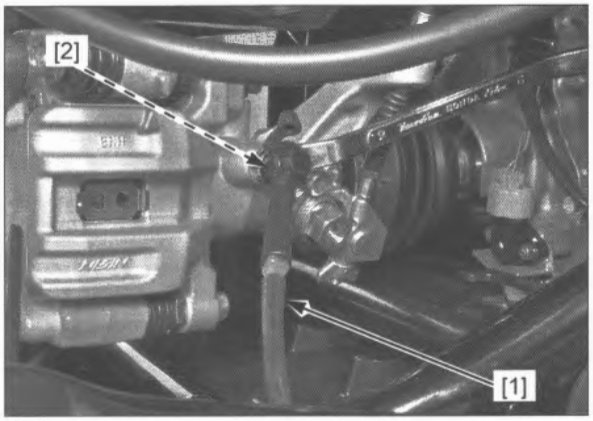
REAR BRAKE (FM5/FM6/FM7/FA5/FA6/FA7)

Remove the rear brake reservoir cap [1], set plate [2] and diaphragm [3].



Connect a bleed hose [1] to the rear brake caliper bleed valve [2].

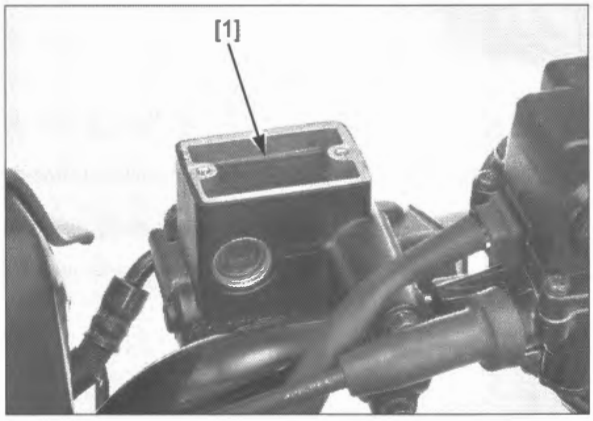
Loosen the bleed valve and pump the brake pedal until no more fluid flows out of the bleed valve.



BRAKE FLUID FILLING/BLEEDING

FRONT BRAKE

Fill the master cylinder reservoir to the casting ledge [1] with DOT 4 brake fluid from a sealed container.



Follow the manufacturer's operating instructions.

Connect a commercially available brake bleeder to the bleed valve.

Operate the brake bleeder and loosen the bleed valve.

Check the fluid level often while bleeding the brake to prevent air from being pumped into the system.

If an automatic refill system is not used, add fluid when the fluid level in the reservoir is low.

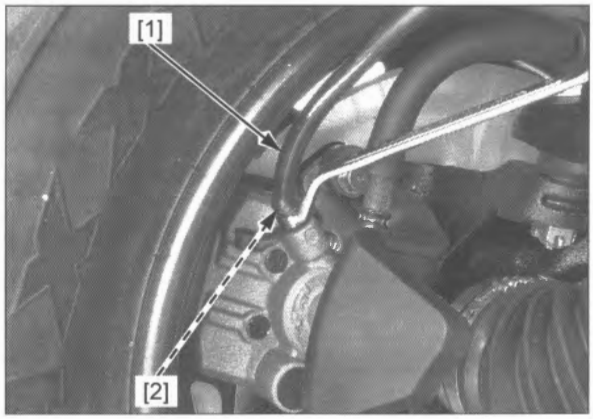
Perform the bleeding procedure until the system is completely flushed/bled.

- If air enters the bleeder from around the bleed valve threads, seal the threads with teflon tape.

Perform air bleeding for the other side bleed valve.

After bleeding air, operate the front brake lever. If it still feels spongy, bleed the system again.

If a brake bleeder is not available, perform the following procedure:



Pump up the system pressure with the front brake lever until lever resistance is felt.

Connect a bleed hose [1] to the front brake caliper bleed valve [2] and bleed the system as follows:

Do not release the brake lever until the bleed valve has been closed.

1. Squeeze the brake lever all the way and loosen the bleed valve 1/4 of a turn. Wait several seconds and then close the bleed valve.
2. Release the brake lever slowly and wait several seconds after it reaches the end of its travel.
3. Repeat steps 1 and 2 until there are no air bubbles in the bleed hose.

Tighten the bleed valve to the specified torque.

TORQUE: 5.4 N·m (0.6 kgf·m, 4.0 lbf·ft)

Perform air bleeding for the other side bleed valve.

After bleeding air, operate the front brake lever. If it still feels spongy, bleed the system again.

Fill the master cylinder reservoir to the casting ledge with DOT 4 brake fluid from a sealed container.

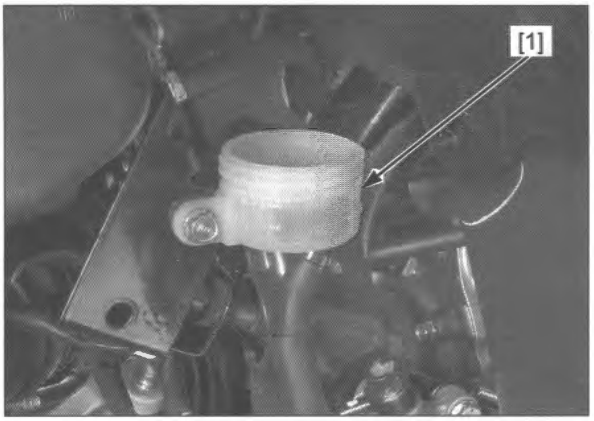
Install the diaphragm, set plate and reservoir cap, and tighten the screws to the specified torque.

TORQUE: 2.0 N·m (0.2 kgf·m, 1.5 lbf·ft)

REAR BRAKE (FM5/FM6/FM7/FA5/FA6/FA7)

Close the rear brake caliper bleed valve.

Fill the rear brake reservoir to the "UPPER" level line [1] with DOT 4 brake fluid from a sealed container.

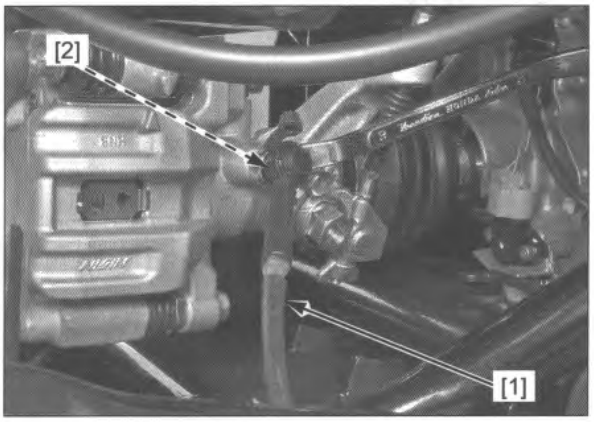


Follow the manufacturer's operating instructions. Check the fluid level often while bleeding the brake to prevent air from being pumped into the system.

Connect a commercially available brake bleeder [1] to the bleed valve [2].

Operate the brake bleeder and loosen the bleed valve.

If an automatic refill system is not used, add fluid when the fluid level in the reservoir is low.



If air enters the bleeder from around the bleed valve threads, seal the threads with teflon tape.

Perform the bleeding procedure until the system is completely flushed/bled.

Tighten the bleed valve.

TORQUE: 5.4 N·m (0.6 kgf·m, 4.0 lbf·ft)

After bleeding air, operate the brake pedal. If it still feels spongy, bleed the system again.

If a brake bleeder is not available, perform the following procedure:

Pump up the system pressure with the brake pedal until pedal resistance is felt.

Connect a bleed hose to the rear brake caliper bleed valve and bleed the system as follows:

Do not release the brake pedal until the bleed valve has been closed.

1. Depress the brake pedal all the way and loosen the bleed valve 1/4 of a turn. Wait several seconds and then close the bleed valve.
2. Release the brake pedal slowly and wait several seconds after it reaches the end of its travel.
3. Repeat steps 1 and 2 until there are no air bubbles in the bleed hose.

Tighten the bleed valve to the specified torque.

TORQUE: 5.4 N·m (0.6 kgf·m, 4.0 lbf·ft)

After bleeding air, operate the brake pedal. If it still feels spongy, bleed the system again.

Fill the reservoir to the "UPPER" level with DOT 4 brake fluid from a sealed container.

Install the diaphragm, set plate and reservoir cap.

BRAKE PAD/DISC

BRAKE PAD REPLACEMENT

FRONT BRAKE PAD

Remove the front wheel (page 18-11).

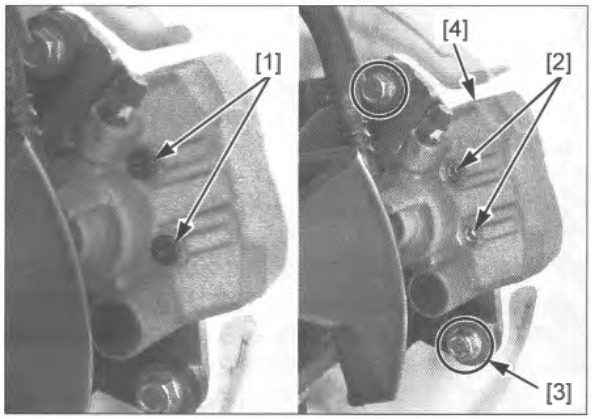
Remove the pad pin plugs [1].

Loosen the pad pins [2].

Remove the two mounting bolts [3] and brake caliper [4].

Check the fluid level in the master cylinder reservoir as this operation causes the fluid level to rise.

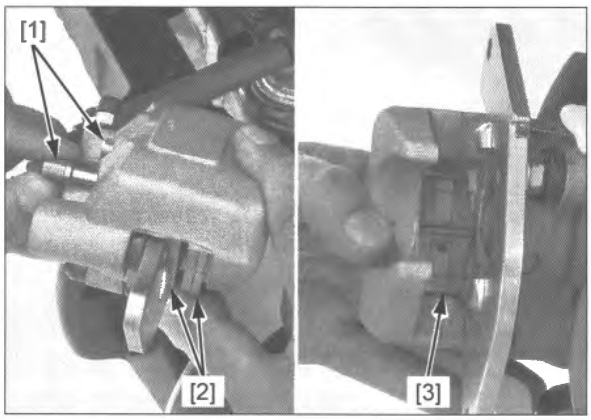
Push the caliper piston all the way in by prying the brake pads to allow installation of new pads.



Pull the pad pins [1] out of the caliper while pushing the brake pads [2] in against the pad spring [3], and remove the pads.

Make sure the pad spring is installed correctly. Always replace the brake pads in pairs to ensure even disc pressure.

Install new brake pads into the caliper body.
Align the pad pin holes in the caliper body and pads by pushing the pads in against the pad spring, and install the pad pins.



Install the brake caliper [1] so the disc is positioned between the pads, being careful not to damage the pads.
Install new mounting bolts [2] and tighten them to the specified torque.

TORQUE: 30 N·m (3.1 kgf·m, 22 lbf·ft)

Tighten the pad pins [3] to the specified torque.

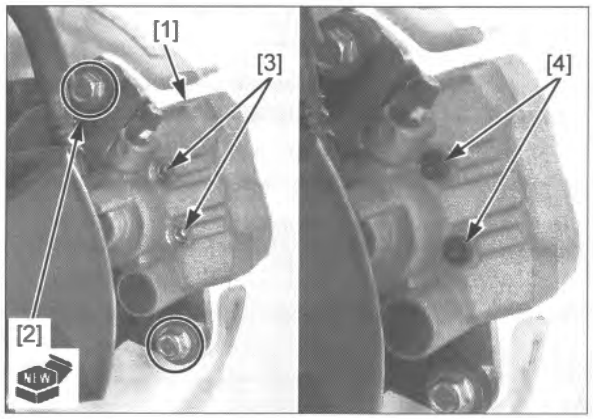
TORQUE: 17.2 N·m (1.8 kgf·m, 13 lbf·ft)

Install the pad pin plugs [4] and tighten them to the specified torque.

TORQUE: 2.4 N·m (0.2 kgf·m, 1.8 lbf·ft)

Squeeze the front brake lever to seat the caliper piston against the pad.

Install the front wheel (page 18-11).

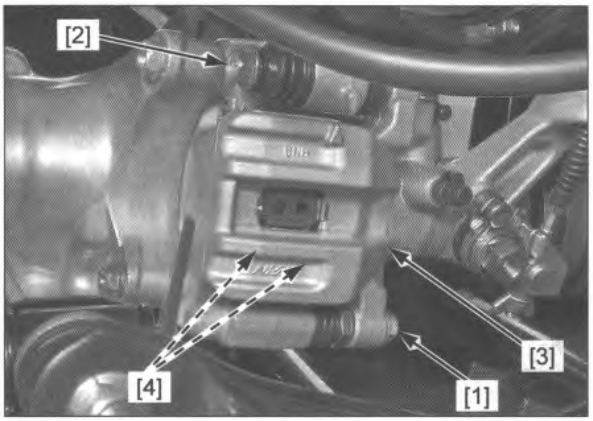


REAR BRAKE PAD (FM5/FM6/FM7/FA5/FA6/FA7)

Remove the bracket pin retaining bolt [1] and bracket pin bolt [2].

Remove the caliper body [3] from the caliper bracket.

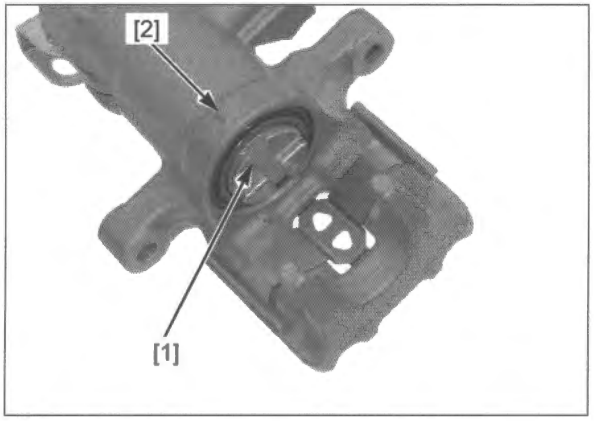
Remove the brake pads [4] from the caliper bracket.



Rotate the caliper piston clockwise using the special tool or equivalent to retract it and align the piston groove [1] with the index mark [2] on the caliper body.

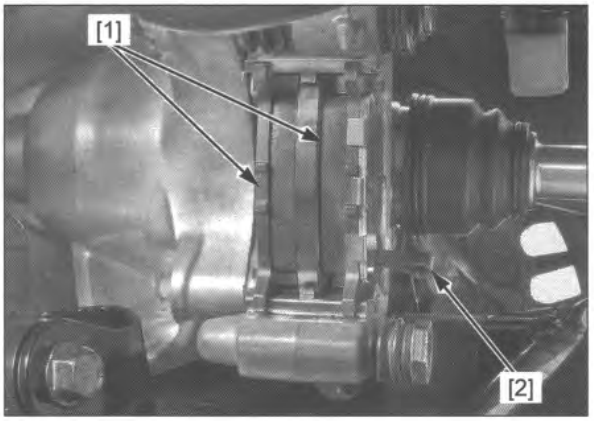
TOOL:
Lock nut wrench, 20 x 24 mm 07716-0020100

Make sure the pad spring is installed correctly.



Always replace the brake pads in pairs to ensure even disc pressure.

Install new pads [1] onto the caliper bracket properly so the wear indicator [2] on the front pad is facing the lower side.

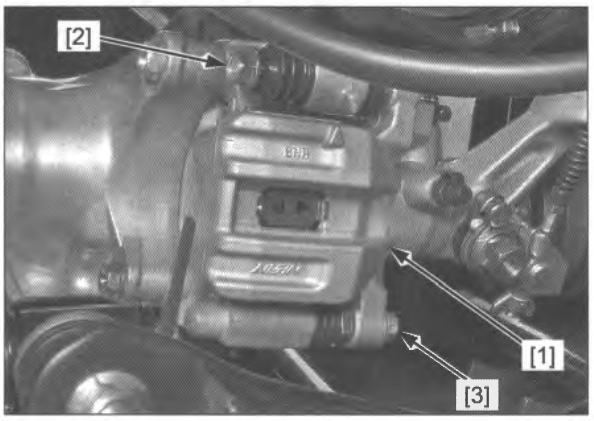


Install the caliper body [1] over the pads and caliper bracket, aligning the groove in the piston with the pin on the pad.

Install the bracket pin bolt [2] and bracket pin retaining bolt [3], and tighten them.

TORQUE:
Bracket pin bolt: 32 N·m (3.3 kgf·m, 24 lbf·ft)
Retaining bolt: 22 N·m (2.2 kgf·m, 16 lbf·ft)

Operate the brake pedal to seat the caliper piston against the pad.



BRAKE DISC INSPECTION

Visually inspect the brake disc for damage or cracks.

Measure the brake disc according to BRAKE SYSTEM SPECIFICATIONS (page 1-15) and replace if necessary.

FRONT MASTER CYLINDER

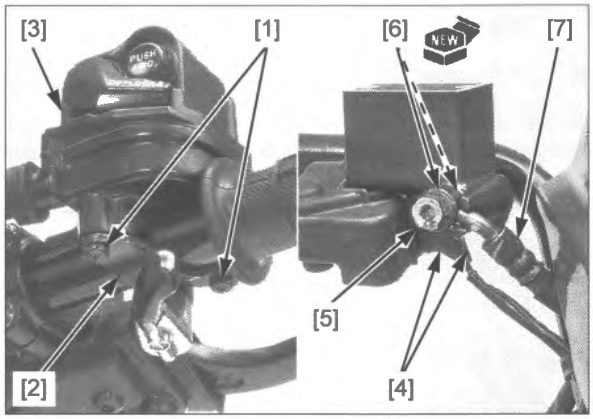
REMOVAL/INSTALLATION

Drain the brake fluid (page 20-7).

When removing the oil bolt, cover the end of the hose to prevent contamination.

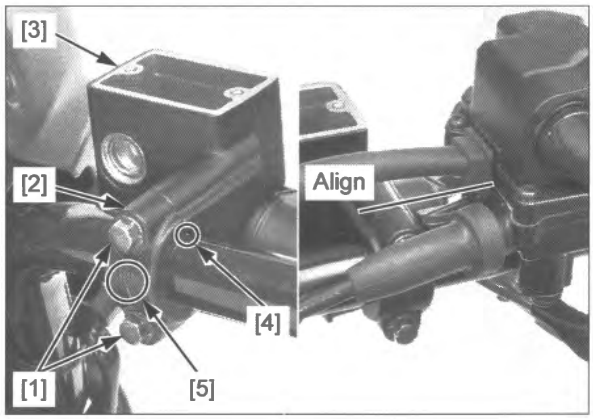
Remove the following:

- screws [1]
- throttle housing holder [2]
- throttle housing [3]
- front brake inhibitor switch wire connectors [4]
- oil bolt [5]
- sealing washers [6]
- brake hose [7]



Remove the following:

- bolts [1]
- master cylinder holder [2]
- master cylinder [3]



Installation is in the reverse order of removal.

- Always replace the sealing washers with new ones.
- Align the edge of the master cylinder with the punch mark [4] on the handlebar.
- Install the master cylinder holder with its "UP" mark [5] facing up.
- Tighten the master cylinder holder upper bolt first, then tighten the lower bolt.
- Align the lug on the throttle housing with the mating line of the master cylinder and holder.
- Set the brake hose joint between the stopper groove in the master cylinder.

TORQUE:

Throttle housing holder screw:
4.2 N·m (0.4 kgf·m, 3.1 lbf·ft)

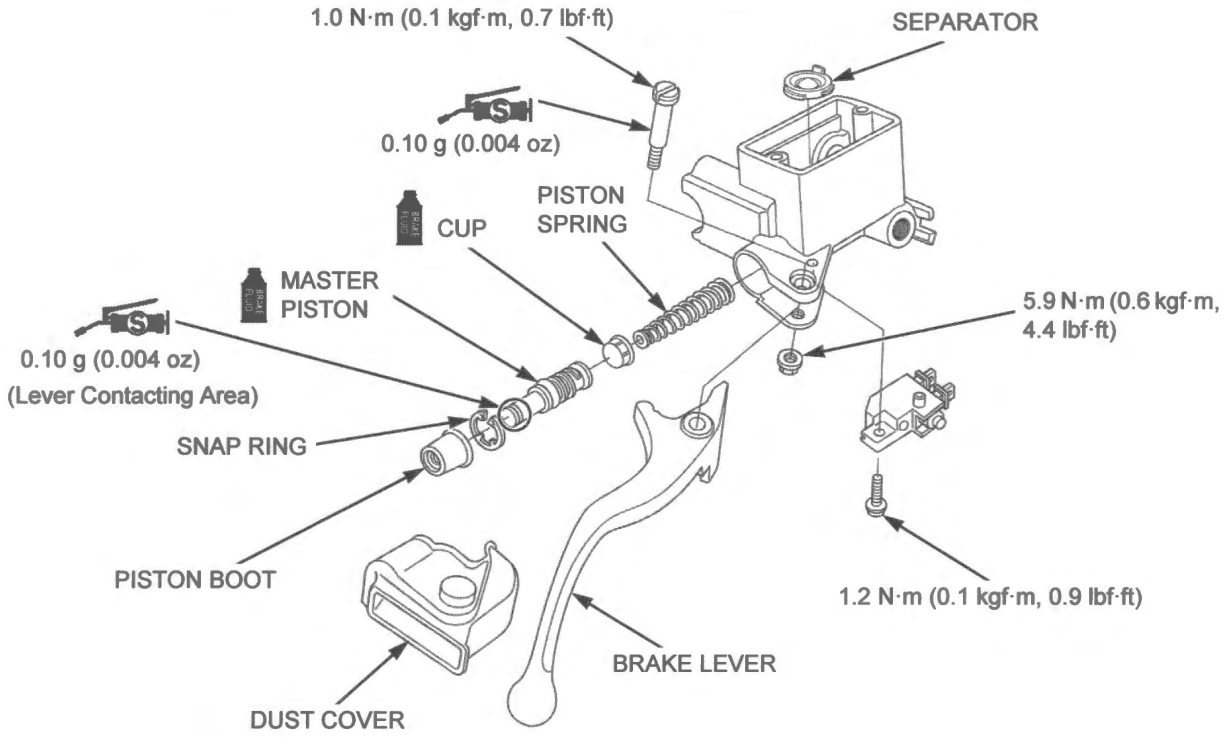
Front master cylinder holder bolt:
12 N·m (1.2 kgf·m, 9 lbf·ft)

Brake hose oil bolt:
34 N·m (3.5 kgf·m, 25 lbf·ft)

Fill and bleed the hydraulic system (page 20-8).

DISASSEMBLY/ASSEMBLY

- Replace the master piston, spring, piston cups and snap ring as a set.
- Do not allow the piston cup lips to turn inside out.
- Be certain the snap ring is firmly seated in the groove.



INSPECTION

Check the following parts for scoring, scratches, deterioration or damage.

- Master cylinder/piston
- Piston cups
- Spring
- Boot

Measure the parts according to BRAKE SYSTEM SPECIFICATIONS (page 1-15) and replace if necessary.

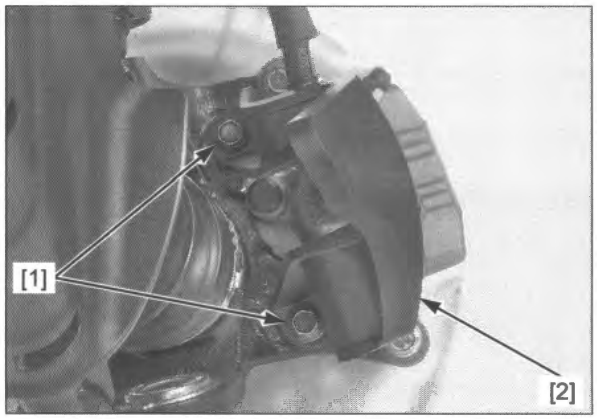
FRONT BRAKE CALIPER

REMOVAL

Remove the front wheel (page 18-11).

Drain the brake fluid (page 20-7).

Remove the two bolts [1] and outboard guard [2].



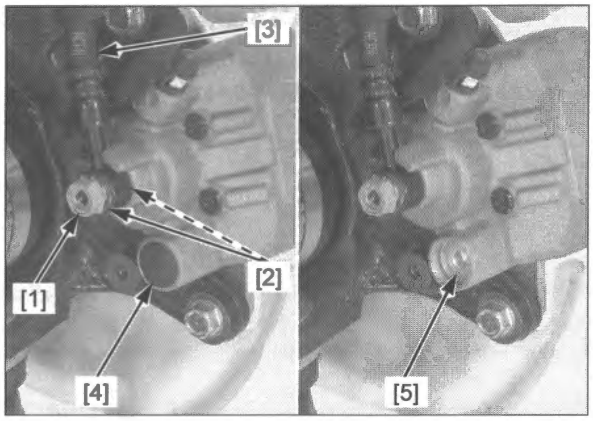
When removing the oil bolt, cover the end of the hose to prevent contamination.

Remove the following:

- oil bolt [1]
- sealing washers [2]
- brake hose [3]
- slide pin plug [4]

Loosen the slide pin [5].

Remove the brake pads (page 20-10).



INSTALLATION

Install the brake pads (page 20-10).

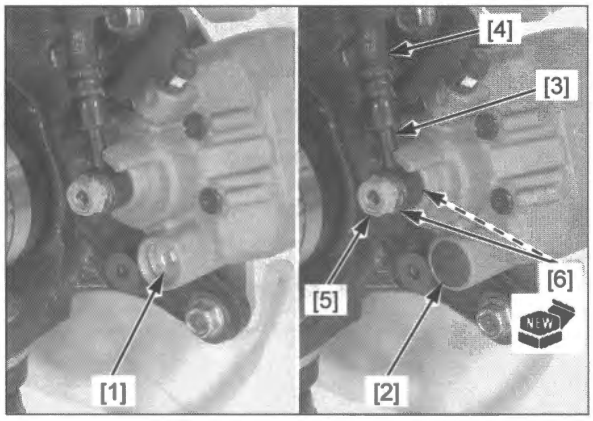
Tighten the slide pin [1] to the specified torque.

TORQUE: 22 N·m (2.2 kgf·m, 16 lbf·ft)

Install the slide pin plug [2].

Rest the brake hose joint [3] onto the stopper on the caliper body.
Connect the brake hose [4] with the oil bolt [5] and new sealing washers [6], and tighten the oil bolt to the specified torque.

TORQUE: 34 N·m (3.5 kgf·m, 25 lbf·ft)

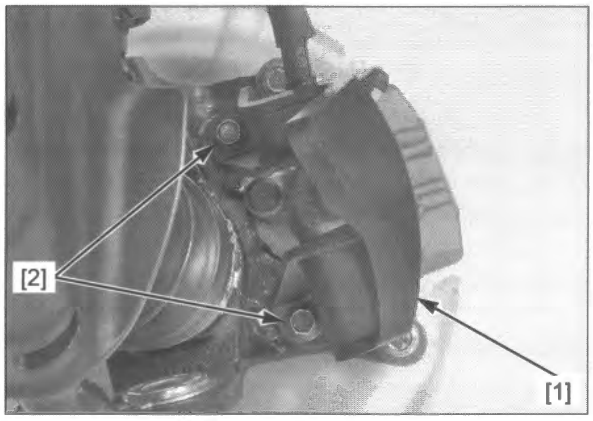


Install the outboard guard [1] and tighten the bolts [2] to the specified torque.

TORQUE: 11 N·m (1.1 kgf·m, 8 lbf·ft)

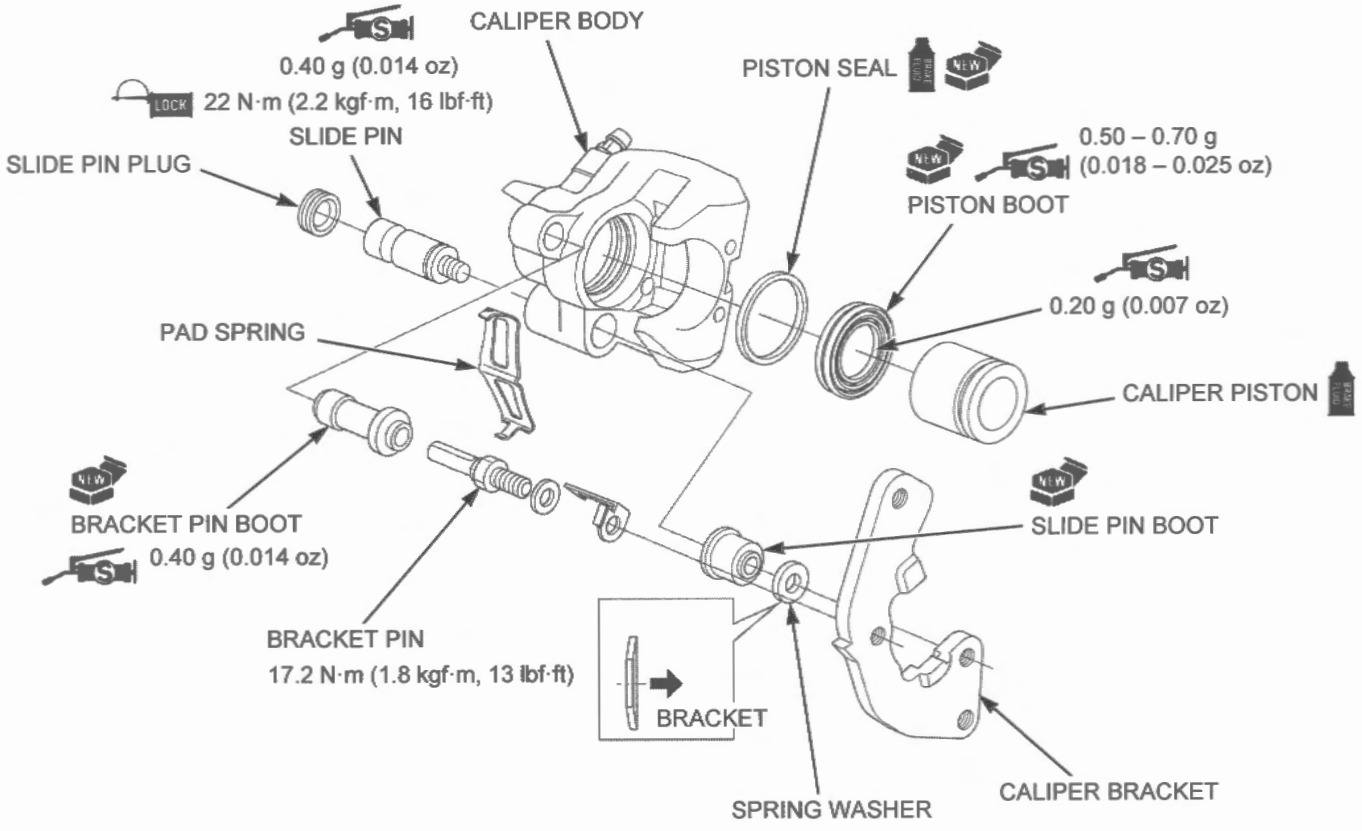
Fill and bleed the hydraulic system (page 20-8).

Install the front wheel (page 18-11).



DISASSEMBLY/ASSEMBLY

- Take care not to damage the piston with the caliper body.
- Be careful not to damage the piston sliding surface.
- Clean the seal and boot grooves, caliper cylinder, and piston with clean brake fluid.
- Install the spring washer onto the slide pin with the concavity toward the bracket side.
- Make sure the boot ribs are seated into the boot grooves in the slide and bracket pins properly.



INSPECTION

Check the caliper cylinder and piston for scoring, scratches or damage.

– Caliper cylinder
– Caliper piston

Measure the parts according to BRAKE SYSTEM SPECIFICATIONS (page 1-15) and replace if necessary.

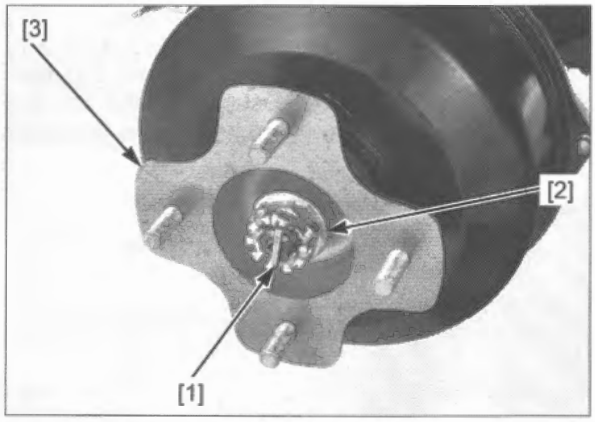
REAR BRAKE DRUM/SHOES (FM1/ FM2/FE1/FE2)

BRAKE DRUM REMOVAL

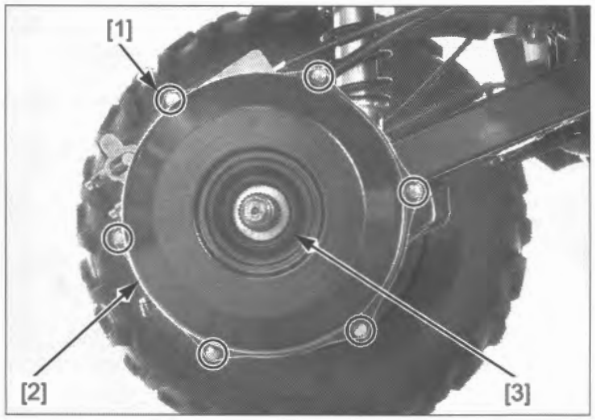
Remove the right rear wheel (page 19-6).

Remove the following:

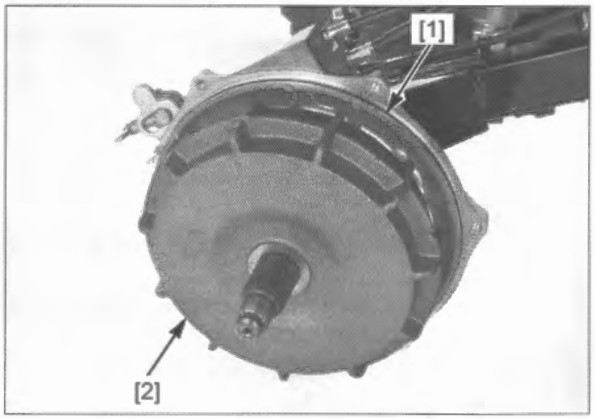
- cotter pin [1]
- hub nut [2]
- wheel hub [3]



- six bolts [1]
- drum cover [2]
- dust seal [3]



- O-ring [1]
- brake drum [2]



INSPECTION

Check the dust seal in the brake panel for wear or damage.

Measure the brake drum according to BRAKE SYSTEM SPECIFICATIONS (page 1-15) and replace if necessary.

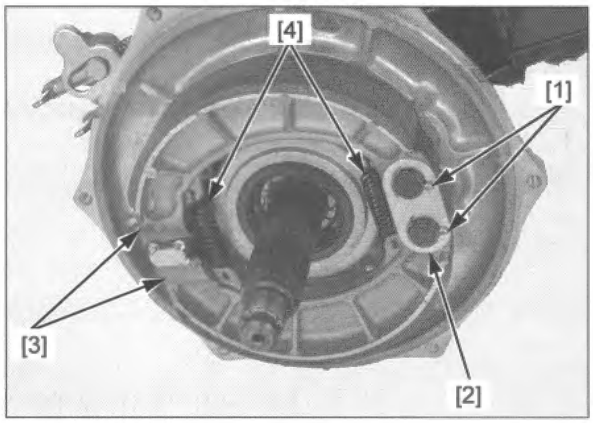
For dust seal replacement (page 20-19).

DISASSEMBLY

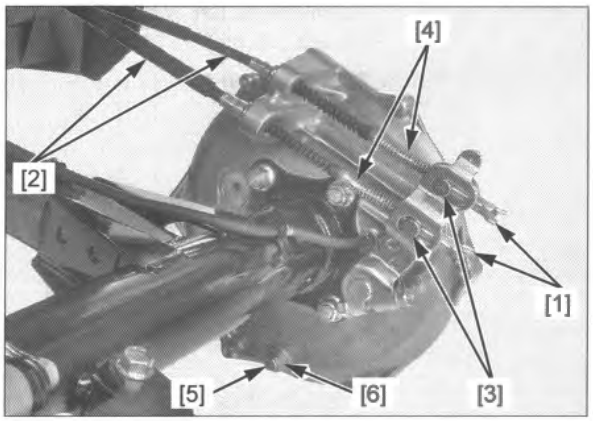
Always replace the brake shoes in pairs.

Remove the following:

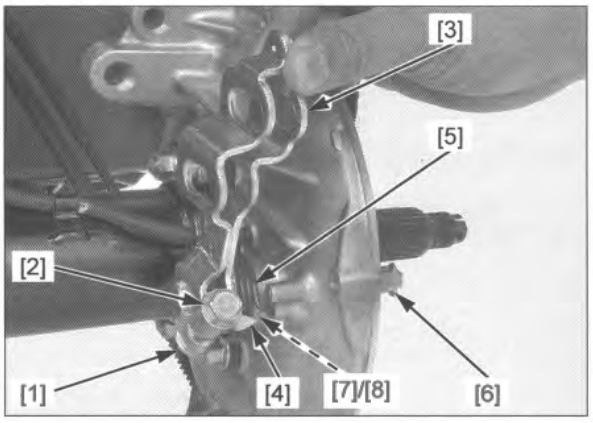
- cotter pins [1]
- setting plate [2]
- brake shoes [3]
- springs [4]



- adjusting nuts [1]
- brake cables [2]
- joint pins [3]
- springs [4]
- Brake panel drain bolt [5] and washer [6]



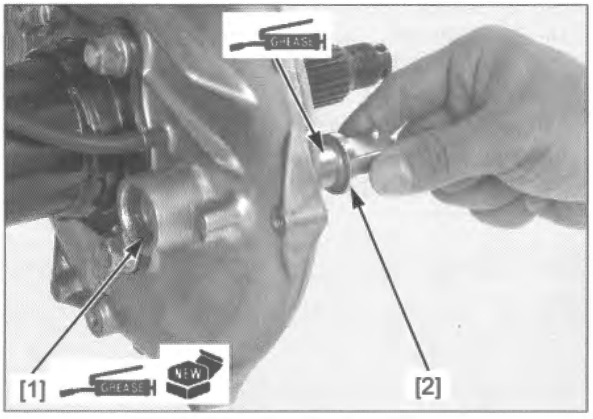
- nut [1] and bolt [2]
- brake arm [3]
- wear indicator [4]
- return spring [5]
- brake cam [6]
- felt seal [7]
- dust seal [8]



ASSEMBLY

Apply grease to the lips of a new dust seal [1] and install it with the flat side facing toward the brake arm until it is fully seated.

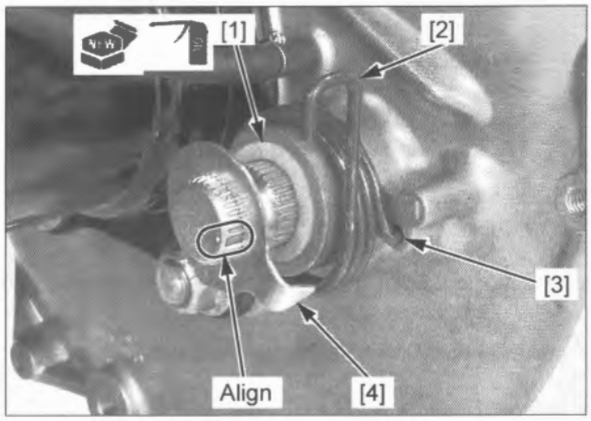
Apply 0.2 – 0.3 g (0.007 – 0.011 oz) of grease to the brake cam [2] spindle and install it.



Apply engine oil to a new felt seal [1] and install it over the brake cam.

Install the return spring [2] by aligning its end with the hole [3].

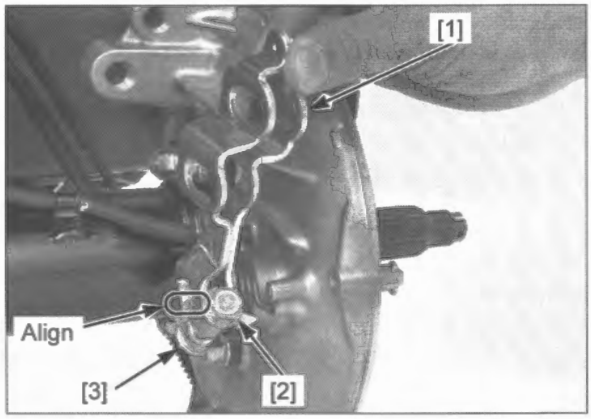
Install the wear indicator [4] by aligning the wide teeth with the wide groove.



Install the brake arm [1] by aligning the punch marks.

Install the pinch bolt [2] from the punch mark side and the nut [3], and tighten it.

TORQUE: 20 N·m (2.0 kgf·m, 15 lbf·ft)

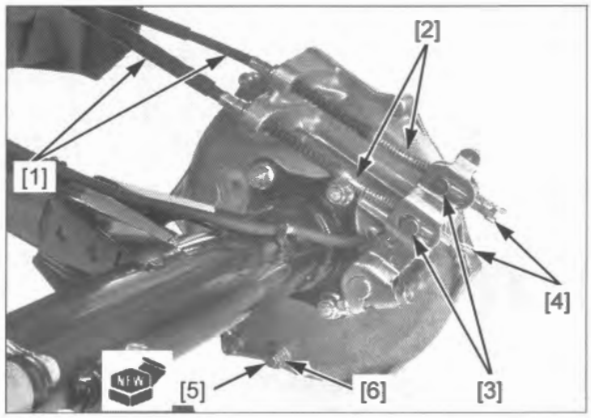


Install the brake cables [1] into the cable holders on the brake panel (upper holder for lever brake cable and lower holder for pedal brake cable).

Install the cable springs [2] onto the cables and the joint pins [3] into the brake arm. Connect the brake cables to the brake arm with the adjusting nuts [4].

Install the brake panel drain bolt with a new sealing washer [5] and tighten the bolt [6] to the specified torque.

TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)



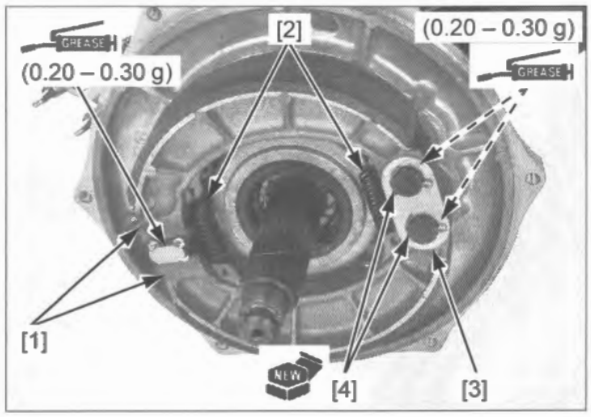
Apply 0.20 – 0.30 g (0.007 – 0.011 oz) of grease to each anchor pin groove and brake cam sliding surfaces.

Do not get grease onto the shoe linings.

Assemble the brake shoes [1] and springs [2] so that the spring ends are facing outside as shown and install the assembly onto the brake panel.

The cotter pins are installed from the front side.

Install the setting plate [3] with the chamfered side (rolled edge side) facing in and secure it with new cotter pins [4].



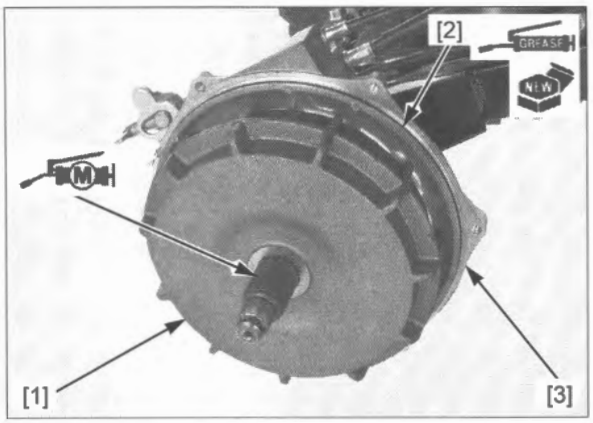
BRAKE DRUM INSTALLATION

Apply molybdenum disulfide grease to the axle splines.

Do not get grease on the brake drum and shoes.

Install the brake drum [1] onto the axle until it is fully seated.

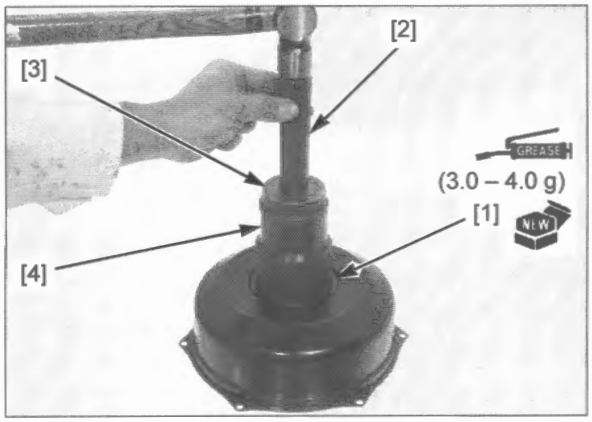
Coat a new O-ring [2] with grease and install it into the groove in the brake panel [3].



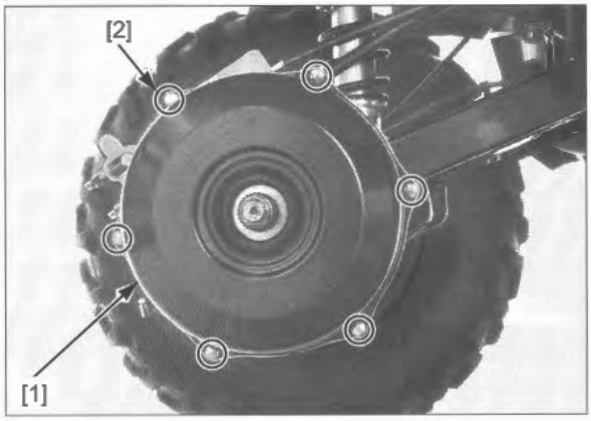
Pack the seal lips of a new dust seal [1] with 3.0 – 4.0 g (0.11 – 0.14 oz) of grease.
Install the dust seal into the drum cover so that it is flush with the cover surface.

TOOLS:

[2] Driver	**07749-0010000**
[3] Attachment, 62 x 68 mm	**07746-0010500**
[4] Base Assembly 56 x 66 mm	**070MF-MEC0300 (Not available in U.S.A.)**



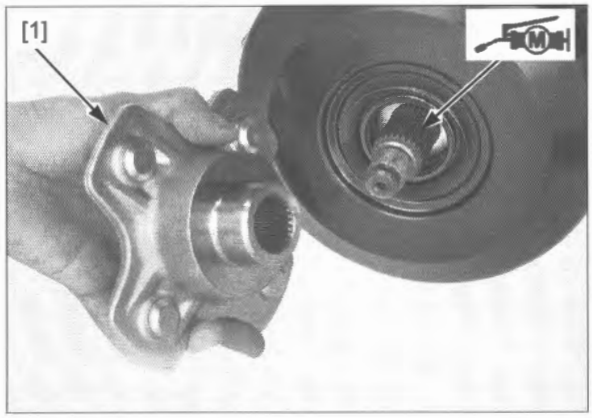
Install the drum cover [1], aligning the bolt holes.
Install the six bolts [2] and tighten them.



Apply molybdenum disulfide grease to the axle splines.

Do not get grease on the axle threads.

Install the wheel hub [1] onto the axle.



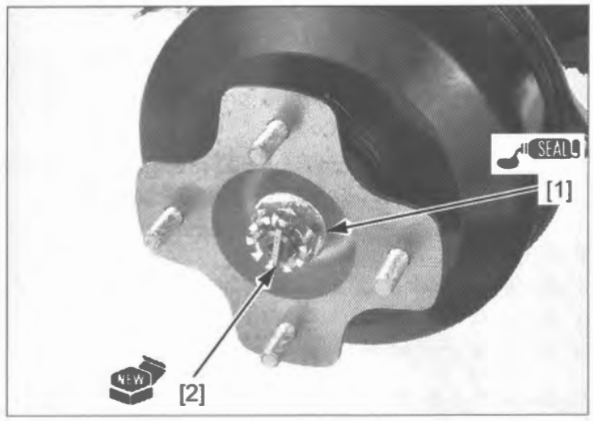
Apply sealant to the hub nut threads (page 1-17).

Install the hub nut [1]
Apply rear brake and tighten the hub nut to the specified torque and further tighten until its grooves align with the cotter pin hole.

TORQUE: 137 N·m (14.0 kgf·m, 101 lbf·ft)

Install a new cotter pin [2].

Install the right rear wheel (page 19-6).
Adjust the rear brake (page 3-26).



REAR BRAKE PEDAL (FM1/FM2/FE1/FE2)

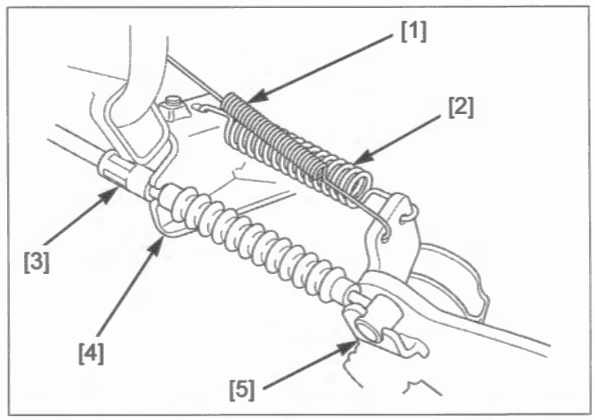
REMOVAL

Remove the right center mudguard (page 2-5).

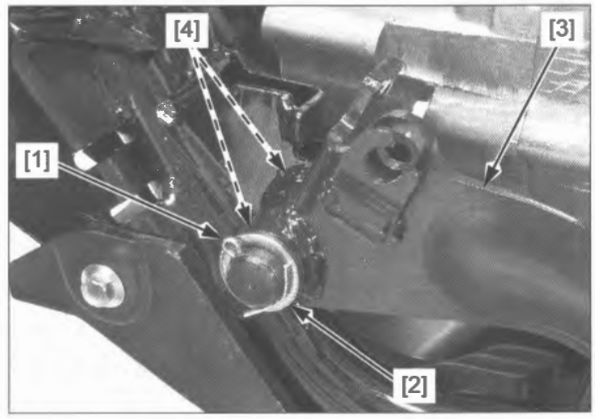
Disconnect the pedal brake cable from the brake arm with the wheel installed (page 20-16).

Remove the following:

- switch spring [1]
- return spring [2]
- brake cable [3] (from the cable holder [4] and pedal [5])



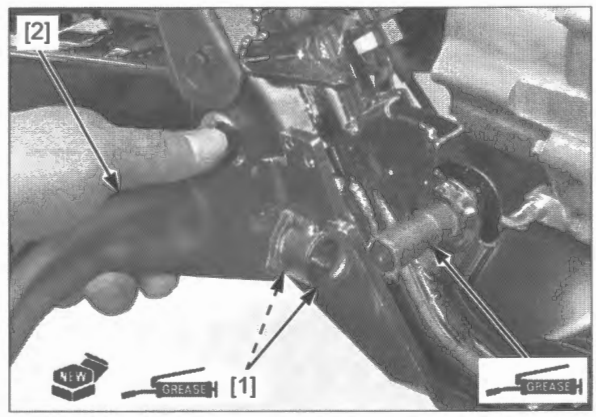
- cotter pin [1]
- washer [2]
- brake pedal [3]
- dust seals [4]



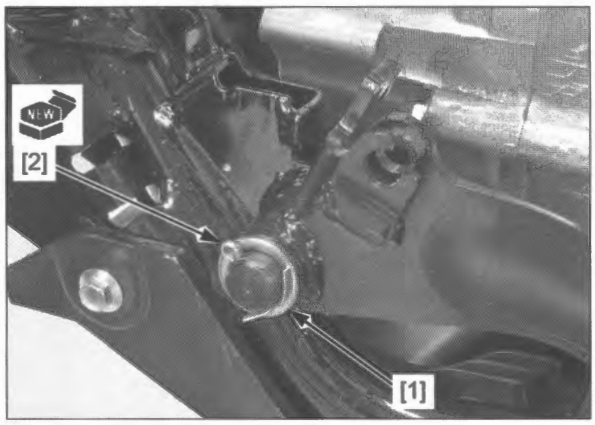
INSTALLATION

Apply grease to the lips of new dust seals [1].
Install the dust seals with the flat side facing out until they are fully seated [2].

Apply grease to the groove in the pivot shaft and install the brake pedal.



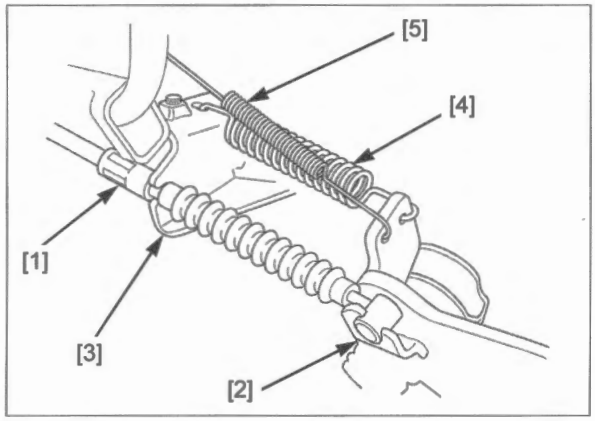
Install the washer [1] and a new cotter pin [2].



Install the brake cable [1] into the pedal [2] and cable holder [3].

Install the return spring [4] and switch spring [5] in the direction as shown.

Connect the brake cable to the brake arm (page 20-19).
Adjust the brake pedal freeplay (page 3-26).
Install the right center mudguard (page 2-5).



REAR BRAKE MASTER CYLINDER/ BRAKE PEDAL (FM5/FM6/FM7/FA5/ FA6/FA7)

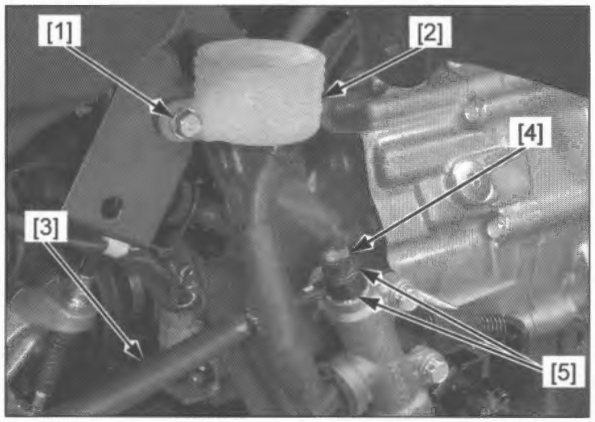
REMOVAL

Drain the brake fluid from the rear brake hydraulic system (page 20-7).

Remove the right center mudguard (page 2-5).

Remove the bolt [1] and rear brake reservoir [2].

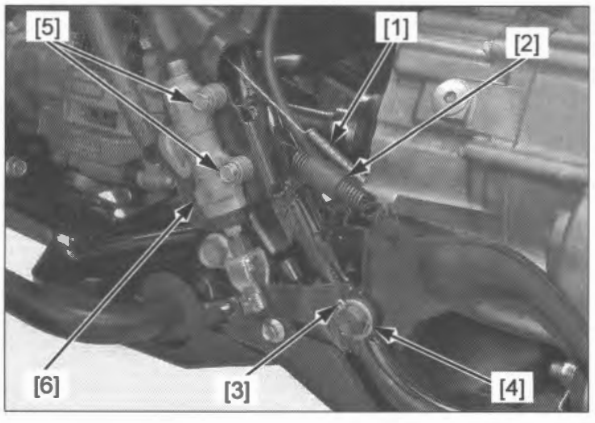
Disconnect the brake hose [3] from the master cylinder by removing the oil bolt [4] and sealing washers [5].



Remove the switch spring [1] and return spring [2].

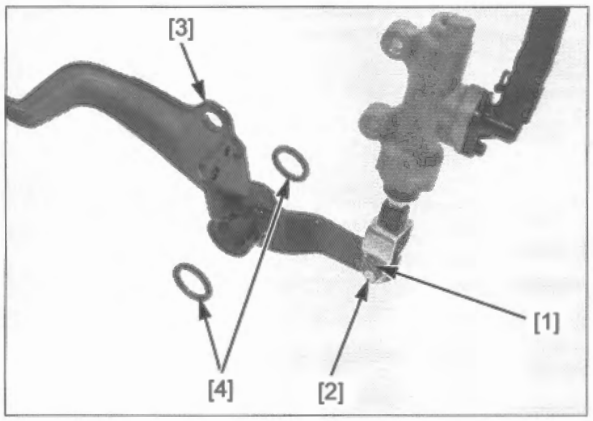
Remove the cotter pin [3] and washer [4] from the pedal pivot.

Remove the mounting bolts [5] and the master cylinder/ pedal assembly [6].



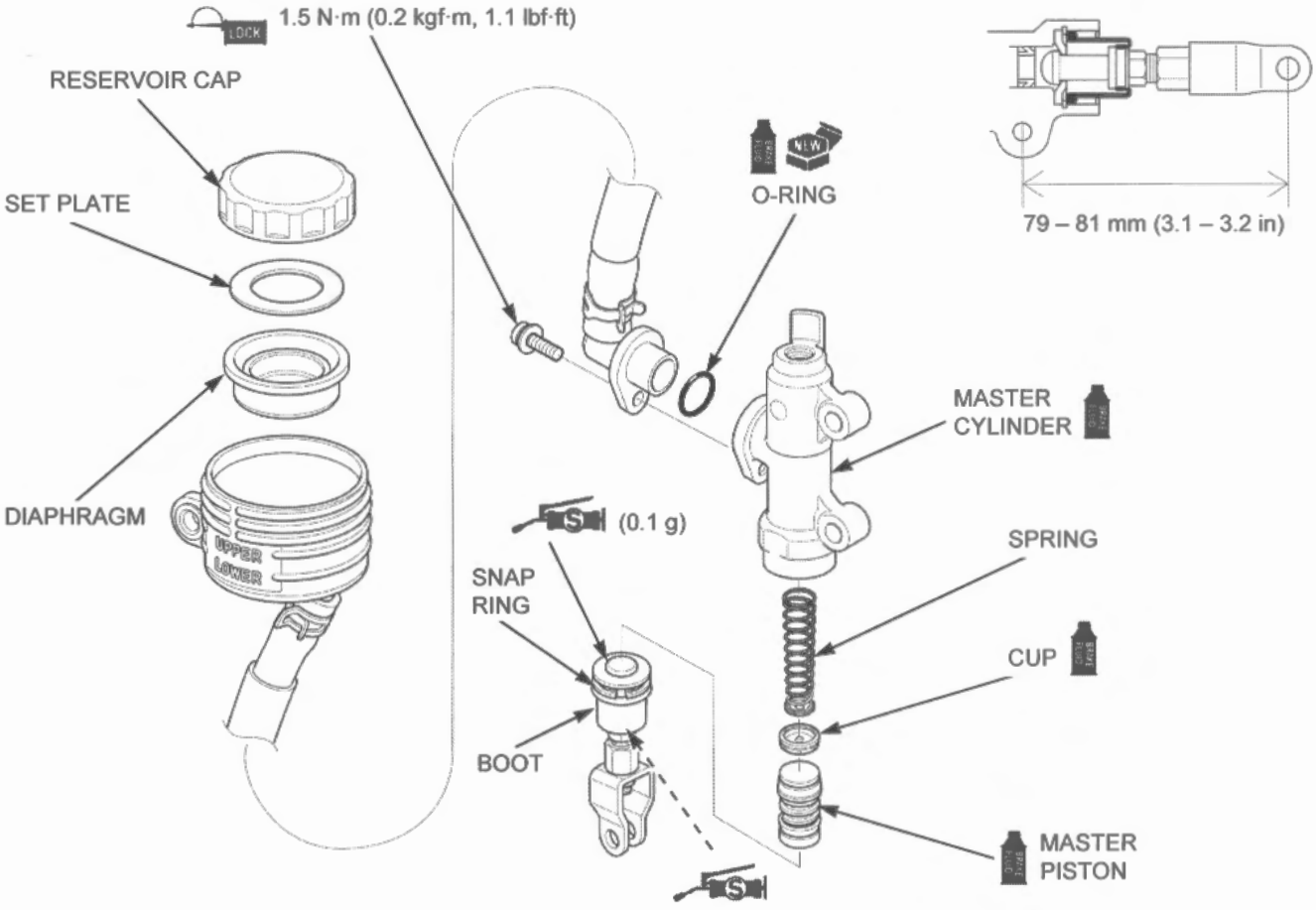
Remove the following from the master cylinder:

- cotter pin [1] and joint pin [2] (to separate the master cylinder from the rear brake pedal [3])
- dust seals [4]



DISASSEMBLY/ASSEMBLY

- Replace the master piston, spring, piston cups and snap ring as a set.
- Do not allow the piston cup lips to turn inside out.
- Be certain the snap ring is firmly seated in the groove.



INSPECTION

Check the following parts for scoring, scratches, deterioration or damage.

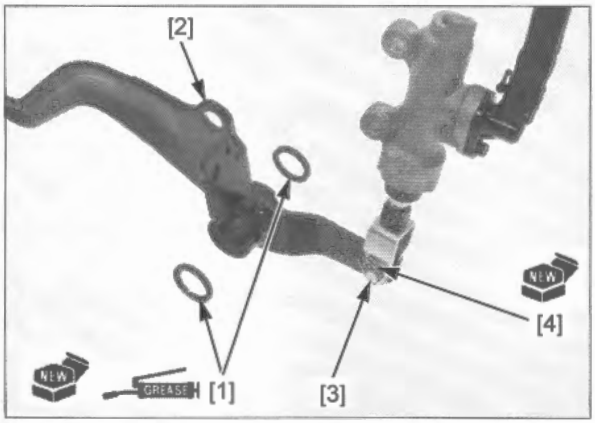
- Master cylinder/piston
- Piston cups
- Spring
- Boot

Measure the parts according to BRAKE SYSTEM SPECIFICATIONS (page 1-15) and replace if necessary.

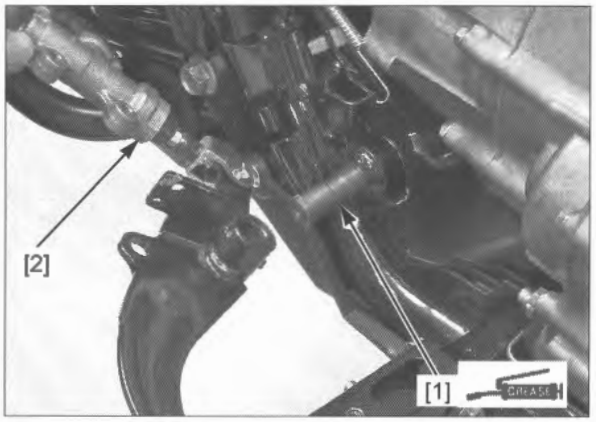
INSTALLATION

Apply grease to the lips of new dust seals [1].
Install the dust seals with the flat surface facing out until they are fully seated.

Assemble the master cylinder and brake pedal [2] with the joint pin [3] (outside) and a new cotter pin (inside) [4].



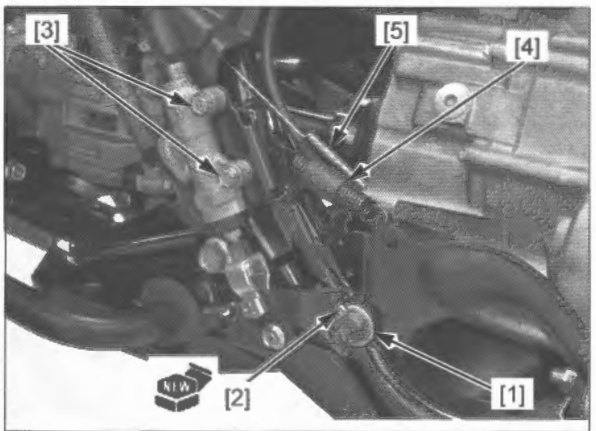
Apply grease to the groove in the pivot shaft [1].
Install the master cylinder/pedal assembly [2] onto the pivot shaft, then install the master cylinder mounting bolts.



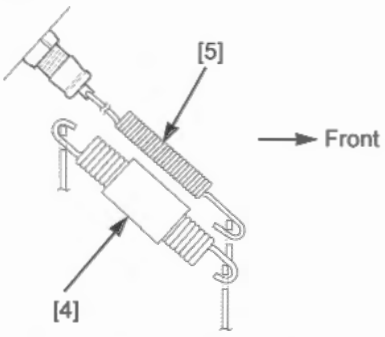
Install the washer [1] and a new cotter pin [2].

Install and tighten the two mounting bolts [3].

Install the return spring [4] and switch spring [5] in the direction as shown.



Spring installation direction:



Connect the brake hose [1] to the master cylinder with the oil bolt [2] and new sealing washers [3].

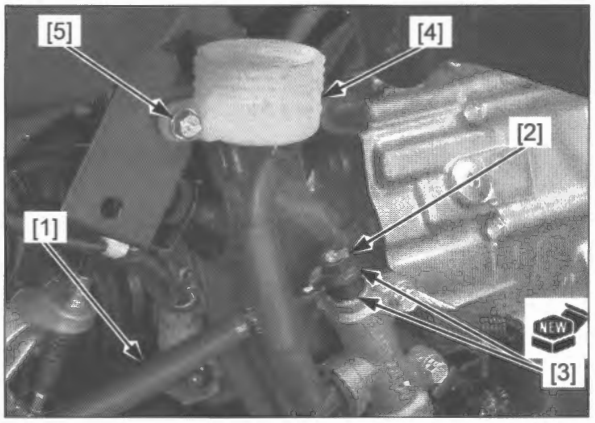
Rest the hose joint against the stopper and tighten the oil bolt.

TORQUE: 34 N·m (3.5 kgf·m, 25 lbf·ft)

Install the rear brake reservoir [4] and tighten the bolt [5].

Fill and bleed the rear brake hydraulic system (page 20-9).

Install the right center mudguard (page 2-5).

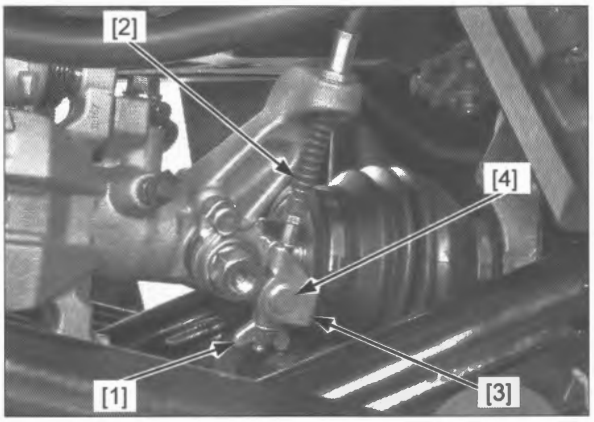


REAR BRAKE CALIPER (FM5/FM6/FM7/FA5/FA6/FA7)

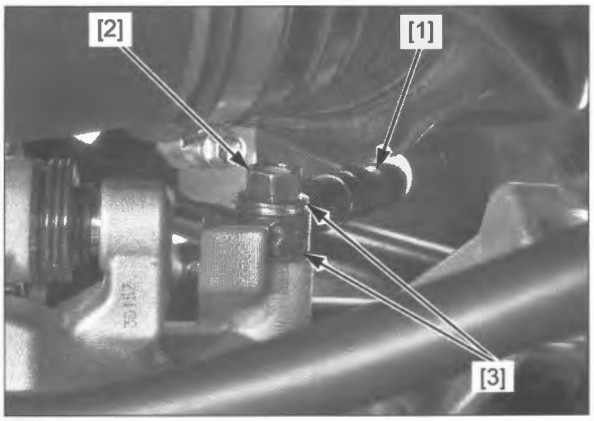
REMOVAL

Drain the brake fluid from the rear brake hydraulic system (page 20-7).

Remove the brake adjusting nut [1]. Disconnect the brake cable [2] from the brake arm [3] and remove the joint pin [4].
Remove the brake cable from the caliper body.

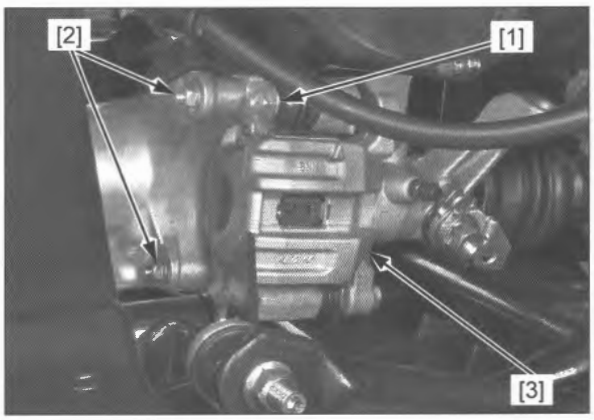


Disconnect the brake hose [1] from the caliper body by removing the oil bolt [2] and sealing washers [3].



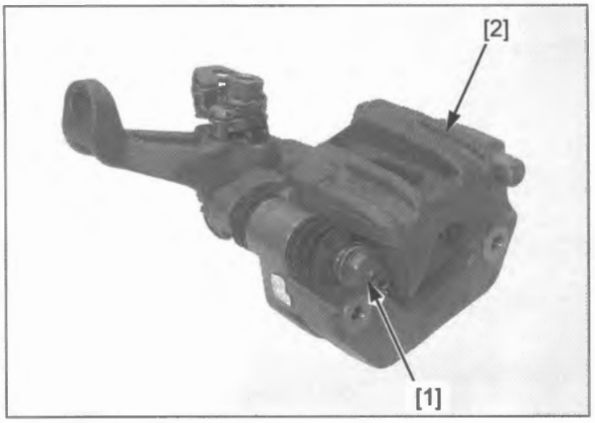
Loosen the bracket pin bolt [1].

Remove the two mounting bolts [2] and the brake caliper [3] out of the frame.

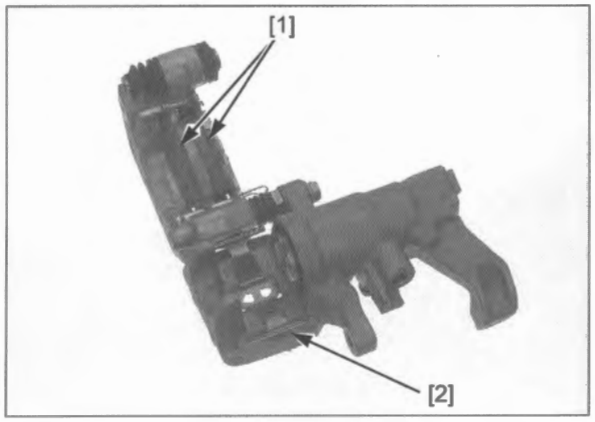


DISASSEMBLY

Remove the slide pin bolt [1] and pivot the caliper body [2].

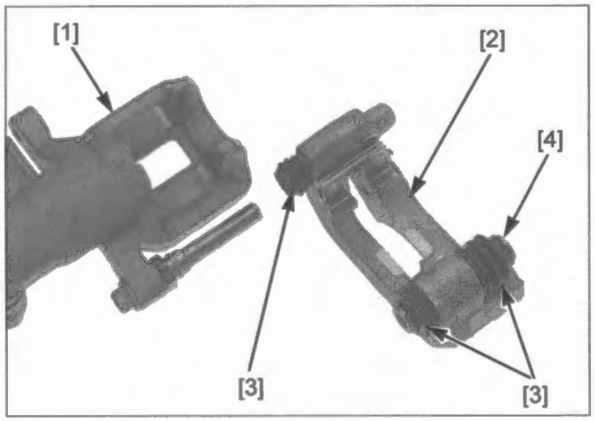


Remove the brake pads [1] and pad spring [2].



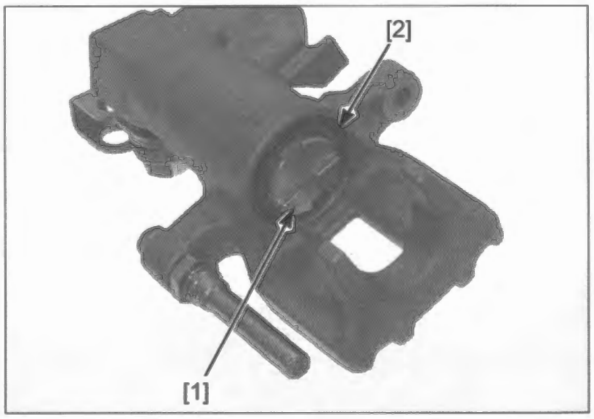
Separate the caliper body [1] from the caliper bracket [2].

Remove the boots [3] and collar [4] from the caliper bracket.



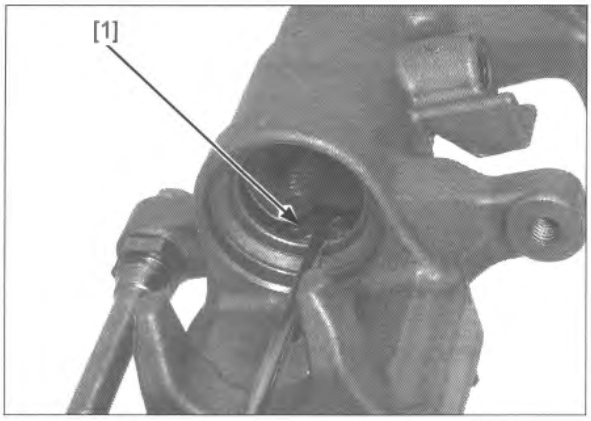
Remove the caliper piston [1] by turning it counterclockwise.

Remove the piston boot [2].



Be careful not to damage the piston sliding surface.

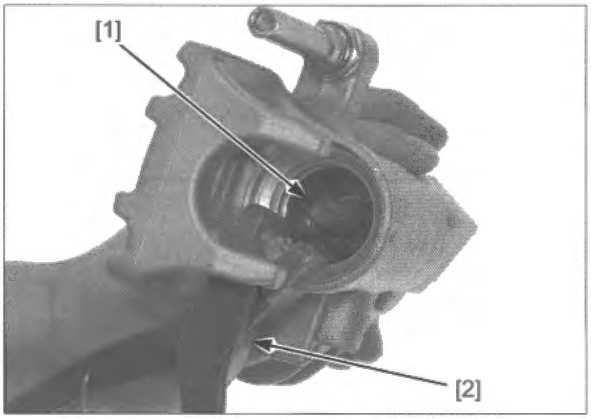
Push the piston seal [1] in and lift it out.



Remove the snap ring [1] using the special tool.

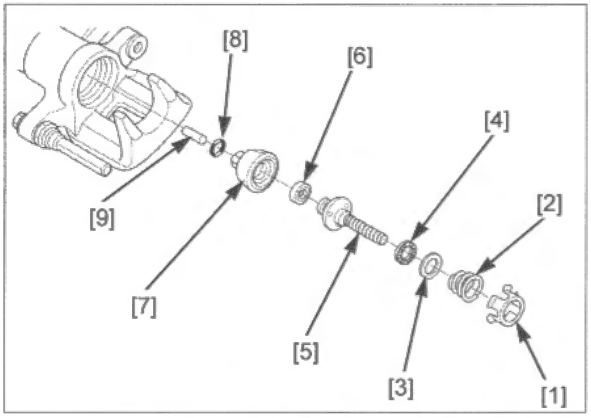
TOOL:

[2] Snap ring pliers	**07914-SA50001 or 07914-3230001**



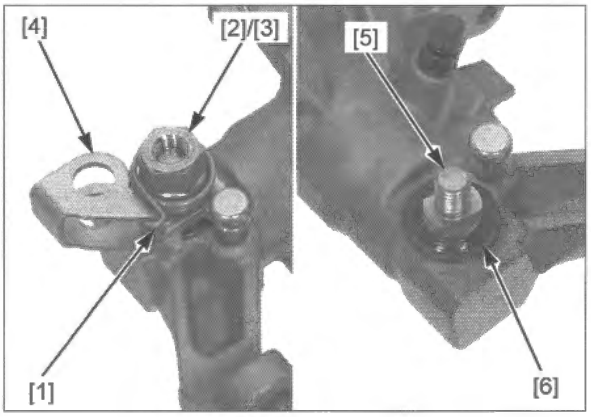
Remove the following:

- spring guide [1]
- adjusting spring B [2]
- spacer [3]
- bearing A [4]
- adjusting bolt [5]
- cup [6]
- sleeve piston [7]
- O-ring [8]
- rod [9]



- return spring [1]
- parking brake arm nut [2]
- spring washer [3]
- brake arm [4]
- brake cam [5]
- dust cover [6]

Clean the disassembled parts.

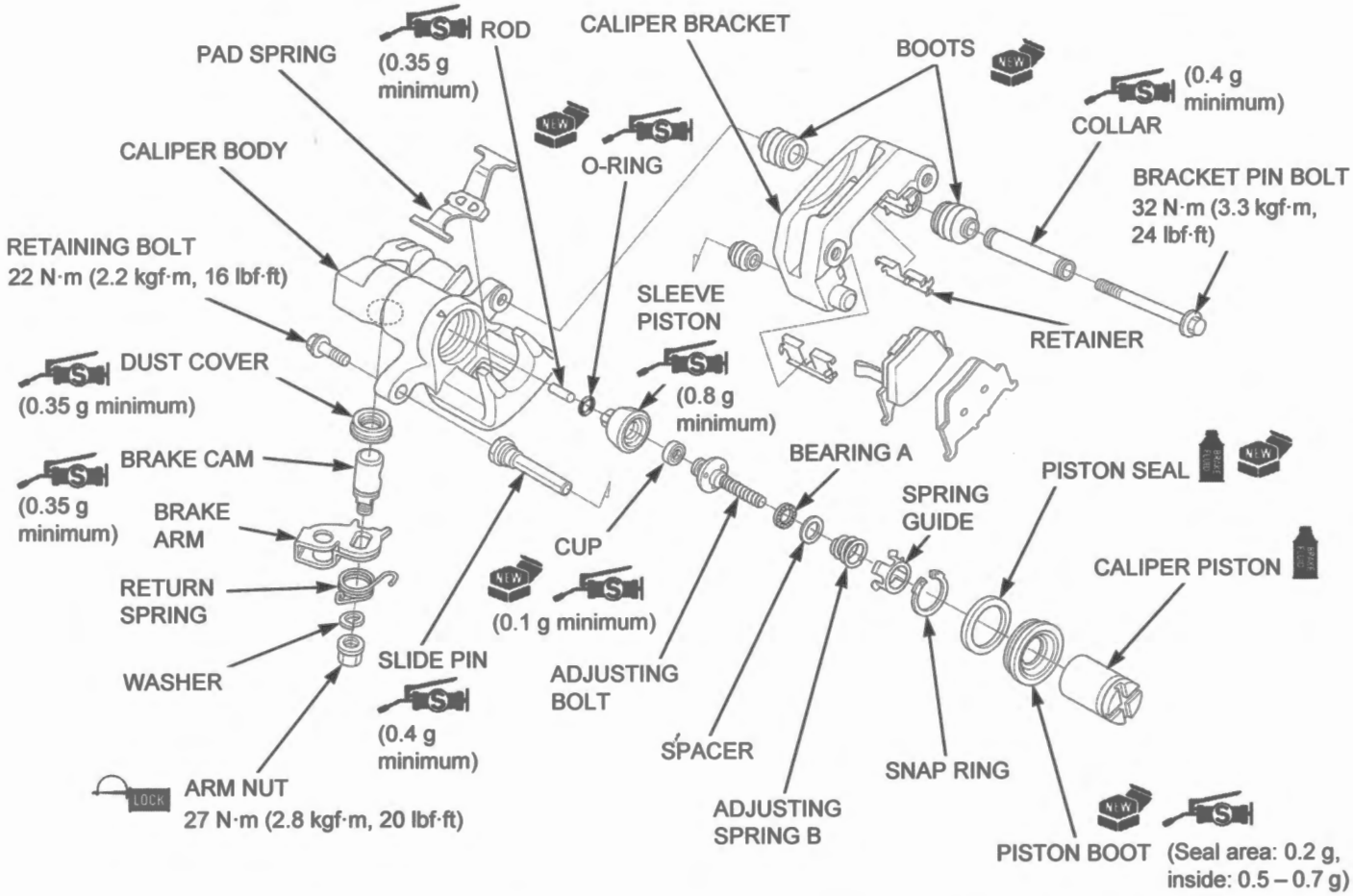


INSPECTION

Check the caliper cylinder and piston for scoring or other damage.



ASSEMBLY



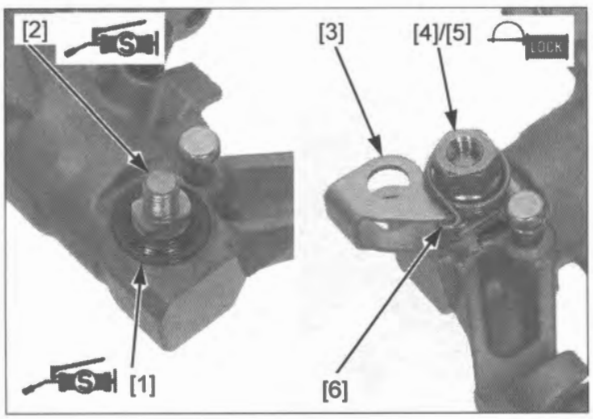
Apply 0.35 g minimum of silicone grease to the dust cover [1] lips and install it into the caliper body.

Apply 0.35 g minimum of silicone grease to the brake cam [2] groove and install it into the caliper body with the groove facing the caliper cylinder.

Install the brake arm [3] and spring washer [4].
Apply locking agent to the parking brake arm nut [5] threads, then install and tighten it to the specified torque.

TORQUE: 27 N·m (2.8 kgf·m, 20 lbf·ft)

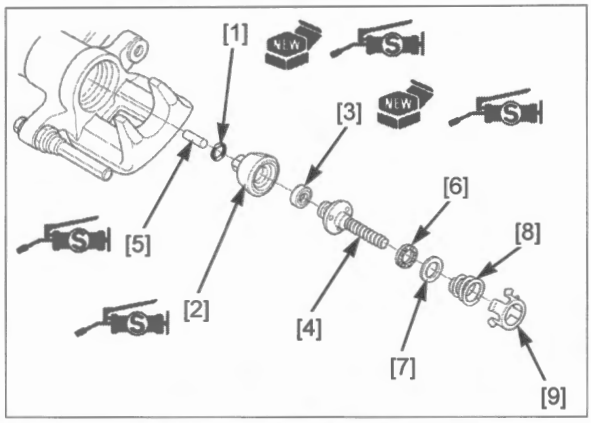
Install the return spring [6] as shown.



Coat a new O-ring [1] with silicone grease and install it into the sleeve piston [2] groove.
Coat a new cup [3] with 0.1 g minimum of silicone grease and install it onto the adjusting bolt [4].
Install the adjusting bolt into the sleeve piston.
Coat the rod [5] ends with 0.35 g minimum of silicone grease and install it into the sleeve piston.

Apply 0.8 g minimum of silicone grease to the sleeve piston assembly and install it in the caliper cylinder by aligning the pins of the piston with the holes in the caliper.

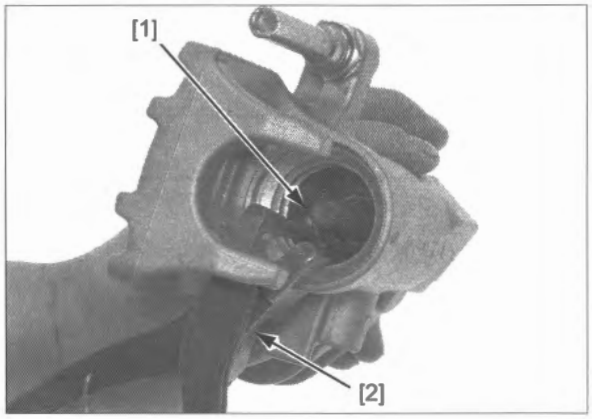
Install bearing A [6], spacer [7], adjusting spring B [8] and spring guide [9] onto the adjusting bolt.



Install the snap ring [1] using the special tool

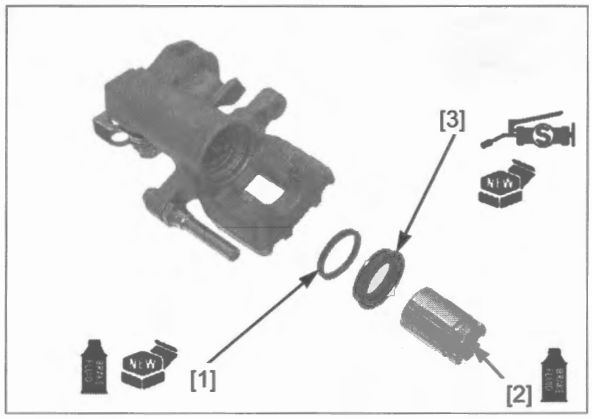
TOOL:

[2] Snap ring pliers	**07914-SA50001 or 07914-3230001**



Coat a new piston seal [1] with clean brake fluid and install it into the seal groove in the caliper.

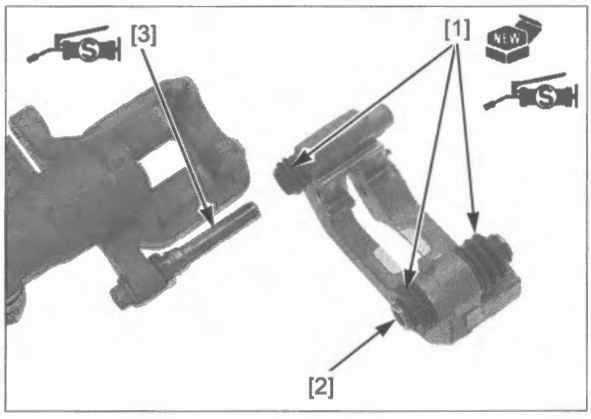
Coat the caliper piston [2] with clean brake fluid.
Apply 0.2 g of silicone grease to the seal area, and 0.5 - 0.7 g to the inside of a new piston boot [3].
Install the piston boot onto the caliper piston.
Install the piston boot into the groove in the caliper.
Install the caliper piston into the caliper cylinder and onto the adjusting bolt by turning it clockwise.
Install the piston boot into the groove in the caliper piston.



Apply 0.4 g minimum of silicone grease to the sliding area of new boots [1] and install them into the caliper bracket.

Apply 0.4 g minimum of silicone grease to the inner surface of the bracket pin collar [2] and install it into the caliper bracket.

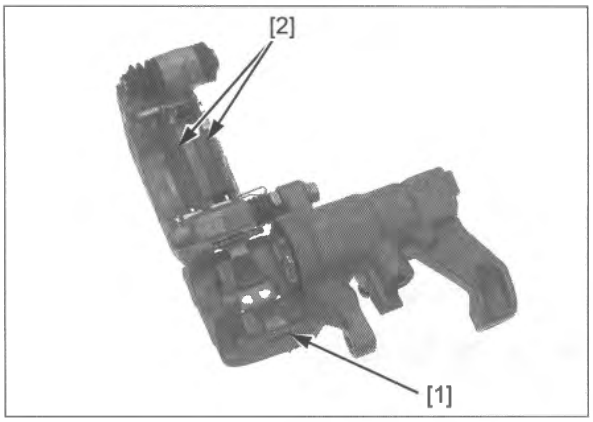
Coat the slide pin [3] of the caliper body with 0.4 g minimum of silicone grease and install it into the caliper bracket.



Install the pad spring [1] in the caliper body as shown.

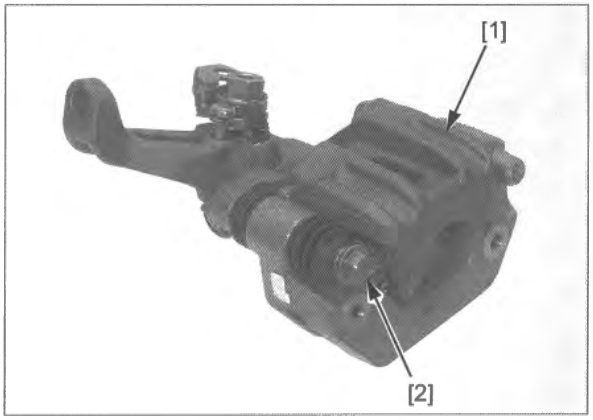
Install the brake pads [2] onto the caliper bracket.

- Align the piston groove with the index mark (page 20-11).



Pivot the caliper body [1] over the pads and bracket.

Temporarily install the bracket pin bolt [2].



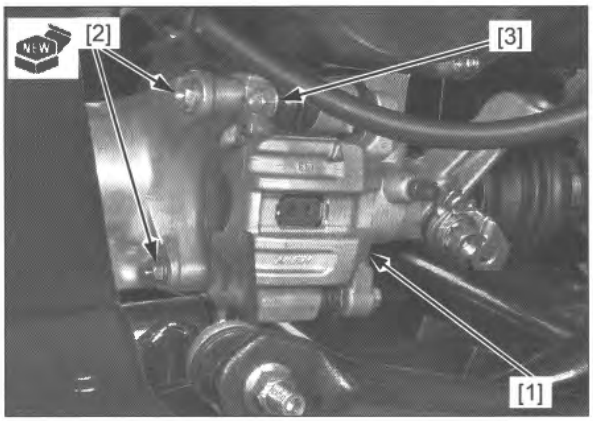
INSTALLATION

Install the brake caliper [1] with new mounting bolts [2] and tighten them.

TORQUE: 30 N·m (3.1 kgf·m, 22 lbf·ft)

Tighten the bracket pin bolt [3].

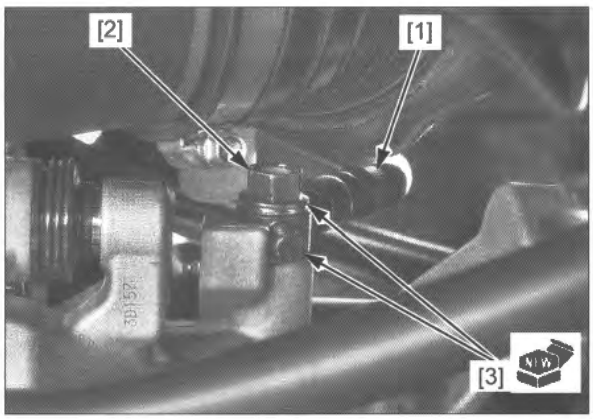
TORQUE: 32 N·m (3.3 kgf·m, 24 lbf·ft)



Connect the brake hose [1] to the brake caliper with the oil bolt [2] and new sealing washers [3].

Rest the hose joint pin against the stopper and tighten the oil bolt.

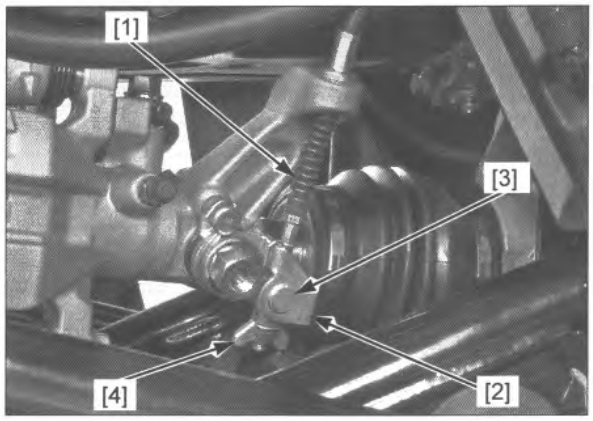
TORQUE: 34 N·m (3.5 kgf·m, 25 lbf·ft)



Install the rear brake cable [1] into the cable holder of the caliper body and connect it to the brake arm [2] with the joint pin [3].
Install the adjusting nut [4].

Fill and bleed the rear brake hydraulic system (page 20-9).

Adjust the brake lever freeplay (page 3-27).



REAR BRAKE LEVER (FM5/FM6/FM7/ FA5/FA6/FA7) ('15 – '19)

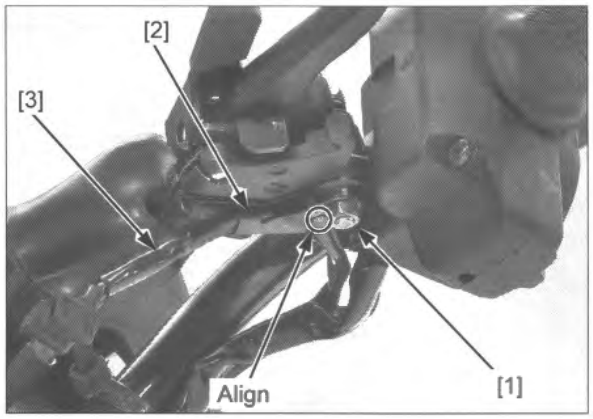
REMOVAL/INSTALLATION

Remove the rear brake lever switch (page 24-16).

Loosen the rear brake cable adjuster (page 3-27).
Loosen the reverse lock cable adjuster (page 3-28).

Remove the following:

– pivot nut [1]
– wire holder plate [2] (by releasing the brake lever switch wire [3])



– pivot bolt [1]
– spring [2]
– reverse arm [3] and rear brake lever [4] (from the lever bracket)

Disconnect the rear brake cable [5] and reverse lock cable [6] from the levers.

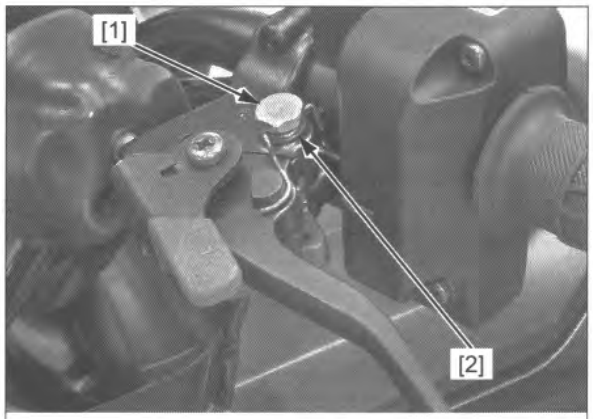
Installation is in the reverse order of removal.

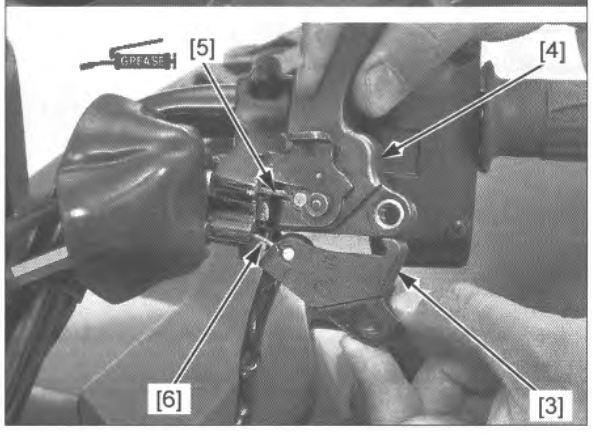
- Apply grease to the rear brake cable end.
- Hook the spring ends as shown.
- Install the wire holder plate by aligning its hole with the lever holder boss.
- Tighten the pivot nut while holding the pivot bolt.

TORQUE:
Rear brake lever pivot bolt:
9.8 N·m (1.0 kgf·m, 7.2 lbf·ft)
Rear brake lever pivot nut:
9.8 N·m (1.0 kgf·m, 7.2 lbf·ft)

Adjust the following:

– rear brake cable (page 3-27)
– reverse lock cable (page 3-28)





REAR BRAKE LEVER (FE2/FA5/FA6/ FA7) (After '19)

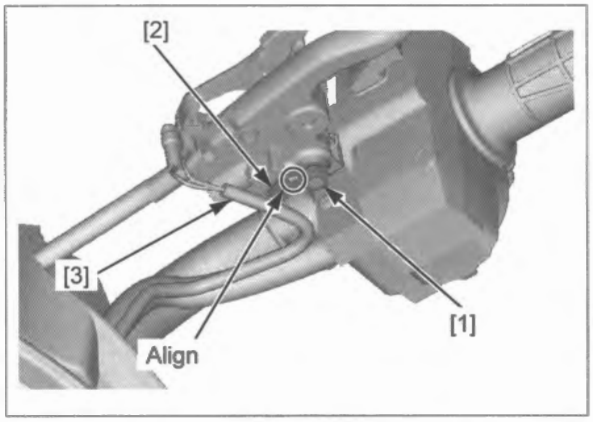
REMOVAL/INSTALLATION

Remove the rear brake lever switch (page 24-16).

Loosen the rear brake cable adjuster (page 3-27).

Remove the following:

- pivot nut [1]
- wire holder plate [2] (by releasing the brake lever switch wire [3])



- pivot bolt [1]
- spring [2]

Remove the rear brake lever [3] with rear brake cable [4].

Disconnect the rear brake cable from the rear brake lever.

Installation is in the reverse order of removal.

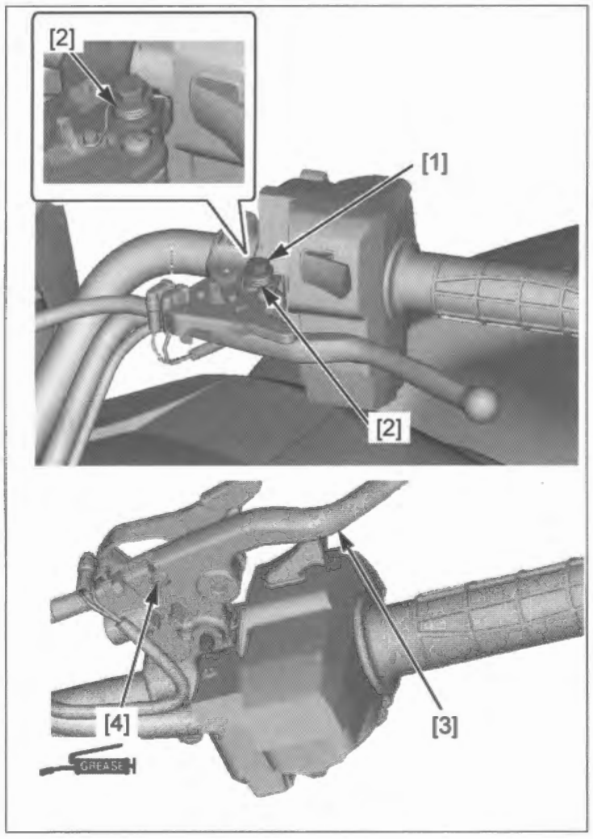
- Apply grease to the rear brake cable end.
- Hook the spring ends as shown.
- Install the wire holder plate by aligning its hole with the lever holder boss.
- Tighten the pivot nut while holding the pivot bolt.

TORQUE:

Rear brake lever pivot bolt:
1.0 N·m (0.1 kgf·m, 0.7 lbf·ft)

Rear brake lever pivot nut:
5.9 N·m (0.6 kgf·m, 4.4 lbf·ft)

Adjust the rear brake cable (page 3-27).



MEMO

21. FRONT DRIVING MECHANISM

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FRONT FINAL GEAR ASSEMBLY 21-50

FRONT FINAL DRIVE INSTALLATION ... 21-57

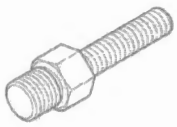
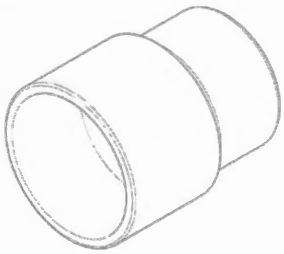
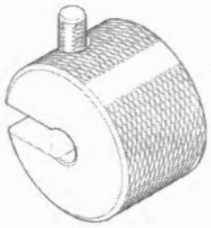
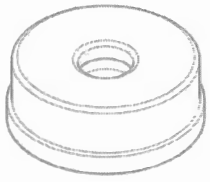
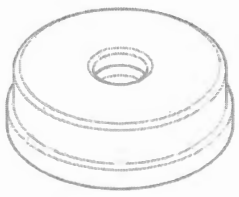
SERVICE INFORMATION

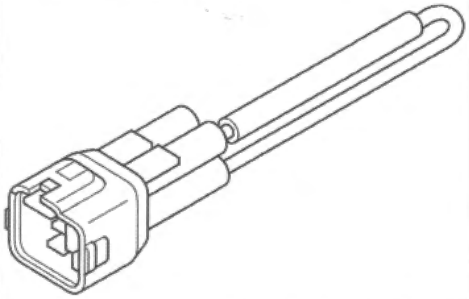
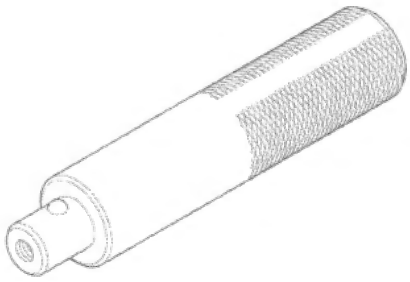
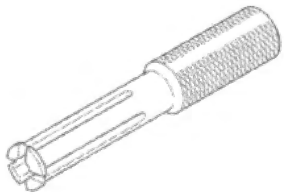
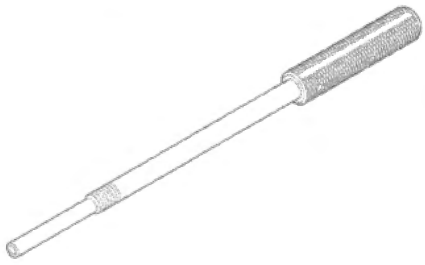
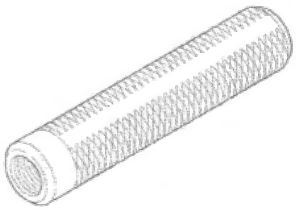
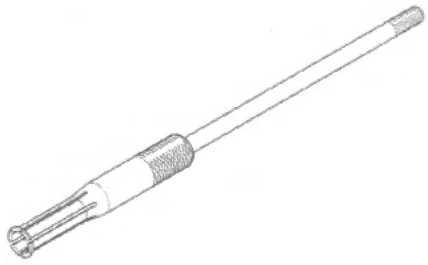
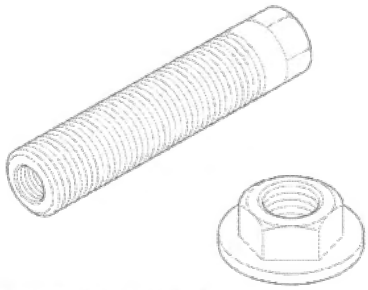
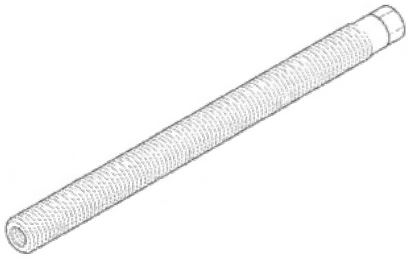
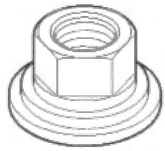
GENERAL

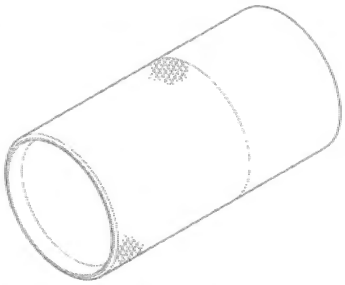
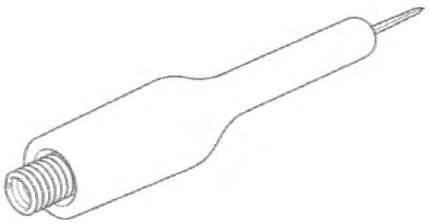
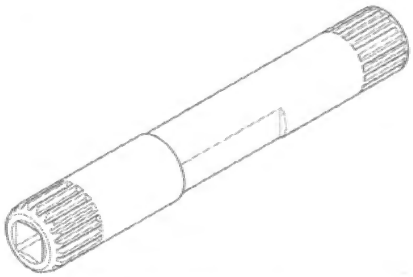
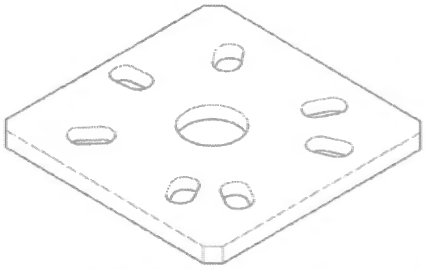
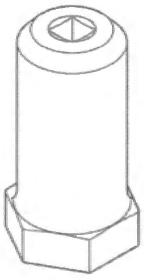
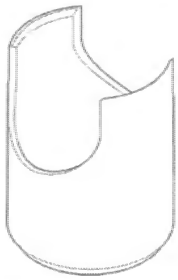
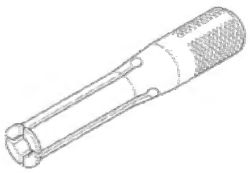
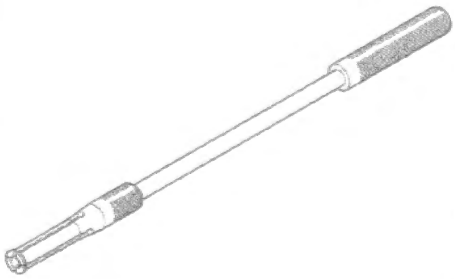
- This section covers service of the electrical system of the differential lock system and mechanical system of the front driving mechanism.
- Perform the gear contact pattern and backlash inspection whenever you replace the bearings, gears or gear case. The extension lines from the gear engagement surfaces should intersect at one point.
- Protect the gear case with a shop towel or soft jaws while holding it in vise. Do not clamp it too tight as it could damage the gear case.
- Replace the ring and pinion gears as a set.
- Replace the cam followers (12 pieces) as a set, and the cam followers, face cams and differential housing as an assembly if the face cam or differential housing is faulty.
- Do not confuse the left and right drive shaft parts.
- A faulty differential lock system is often related to poorly connected or corroded connectors. Check those connections before proceeding.
- Use a digital tester for differential lock system inspection.
- Do not disassemble the difflock actuator.
- The following color codes are used throughout this section.

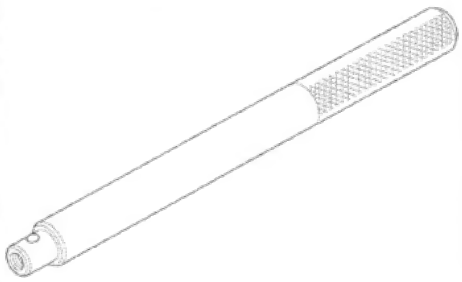
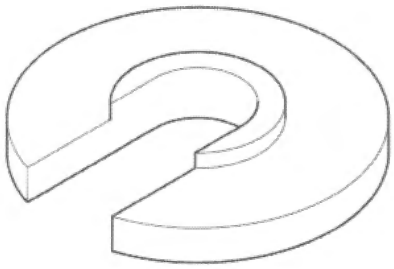
Bl = Black	Bu = Blue	Gr = Gray	O = Orange	R = Red	W = White
Br = Brown	G = Green	Lg = Light green	P = Pink	Lb = Light blue	Y = Yellow
V = Violet					

TOOLS

Adapter Threaded 070MF-HP50100  or 070MF-HP5A100 (U.S.A. only)	Base Assembly 56 x 66 mm 070MF-MEC0300  Not available in U.S.A.	Remover Weight 07741-0010201  or 07936-371020A (U.S.A. only)
Attachment, 52 x 55 mm 07746-0010400 	Attachment, 62 x 68 mm 07746-0010500 	Attachment, 22 x 24 mm 07746-0010800  or 07746-001A800 (U.S.A. only)

Attachment, 42 mm I.D. 07QAD-P0A0100 	Attachment, 35 mm I.D. 07746-0030400 	Pilot, 12 mm 07746-0040200 
SCS Service Connector 070PZ-ZY30100 	Driver 07749-0010000 	Remover Head, 12 mm 07936-1660110 
Remover Shaft, 12 mm 07936-1660120  Not available in U.S.A.	Remover Handle 07936-3710100 	Bearing remover, 12 mm 07936-166010A (U.S.A. only) 
Threaded Shaft 12 x 1.25 x 80L 07965-VM00200  Not available in U.S.A.	Puller shaft 07931-ME4010B (U.S.A. only) 	Special nut 07931-HB3020A (U.S.A. only) 

Attachment 07GAF-SD40200 	Pilot, 32 mm 07MAD-PR90200 	Pin Probe Male (2 pack) 07ZAJ-RDJA110 
Torque Slip Inspection Attachment (2 required) 07KMK-HC50101  or 07KMK-HC5010A (U.S.A. only)	Pinion Puller Plate 07HMC-MM80210  or 07HMC-MM8011A (U.S.A. only)	Lock Nut Wrench, 44 mm 070MA-HR40100  or 070MA-HR4A100 (U.S.A. only)
Compressor Diff Bearing Clip 26 mm 070ME-HP50100  or 070ME-HP5A100 (U.S.A. only)	Attachment, 24 x 26 mm 07746-0010700 	Pilot, 15 mm 07746-0040300 
Remover Shaft, 15 mm 07936-KC10100  Not available in U.S.A.	Remover Head, 15 mm 07936-KC10200  Not available in U.S.A.	Bearing remover, 15 mm 07936-KC10500 (U.S.A. only) 

Driver 07949-3710001	Half shaft disassembly plate 070MF-HR3A100 (U.S.A. only)
	

MECHANICAL SYSTEM TROUBLESHOOTING

Consistent noise during cruising
- Oil level too low
- Foreign matter contaminating gear oil
- Worn or damaged bearing
- Worn or damaged ring gear and pinion gear
- Deformed ring gear or gear case
- Improper tooth contact between ring gear and pinion gear

Gear noises while running
- Oil level too low
- Foreign matter contaminating gear oil
- Chipped or damaged gears
- Improper tooth contact between ring gear and pinion gear

Gear noises while coasting
- Chipped or damaged gears

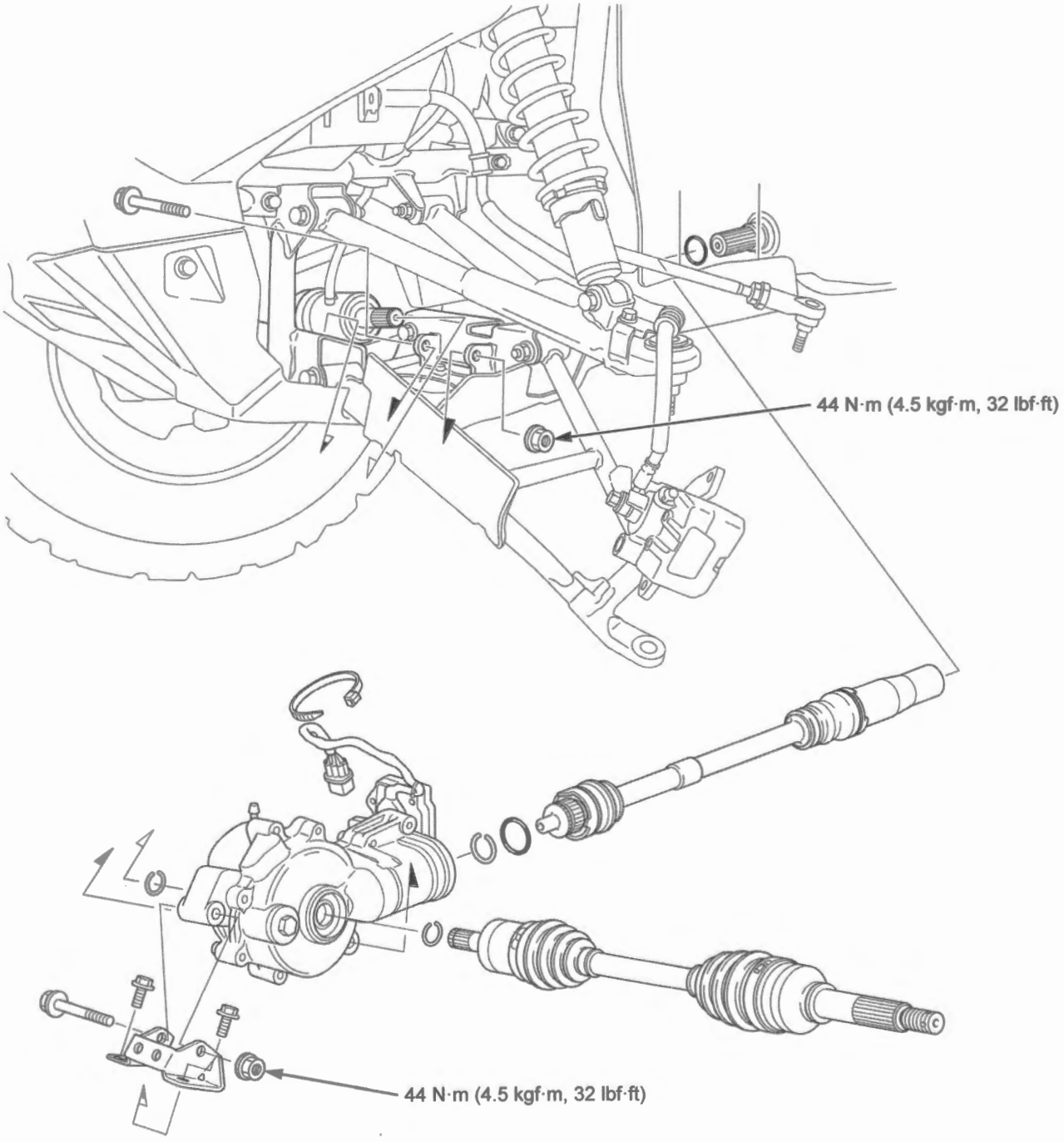
Abnormal noises when turning
- Worn or damaged ring gear bearing
- Worn or damaged face cams and cam followers
- Worn or damaged differential housing grooves
- Worn cone spring or shim

Abnormal noises at start or during acceleration
- Excessive backlash between ring gear and pinion gear
- Worn differential splines
- Loose fasteners
- Worn cone spring or shim

Oil leak
- Oil level too high
- Clogged breather
- Damaged seals
- Loose case cover bolt

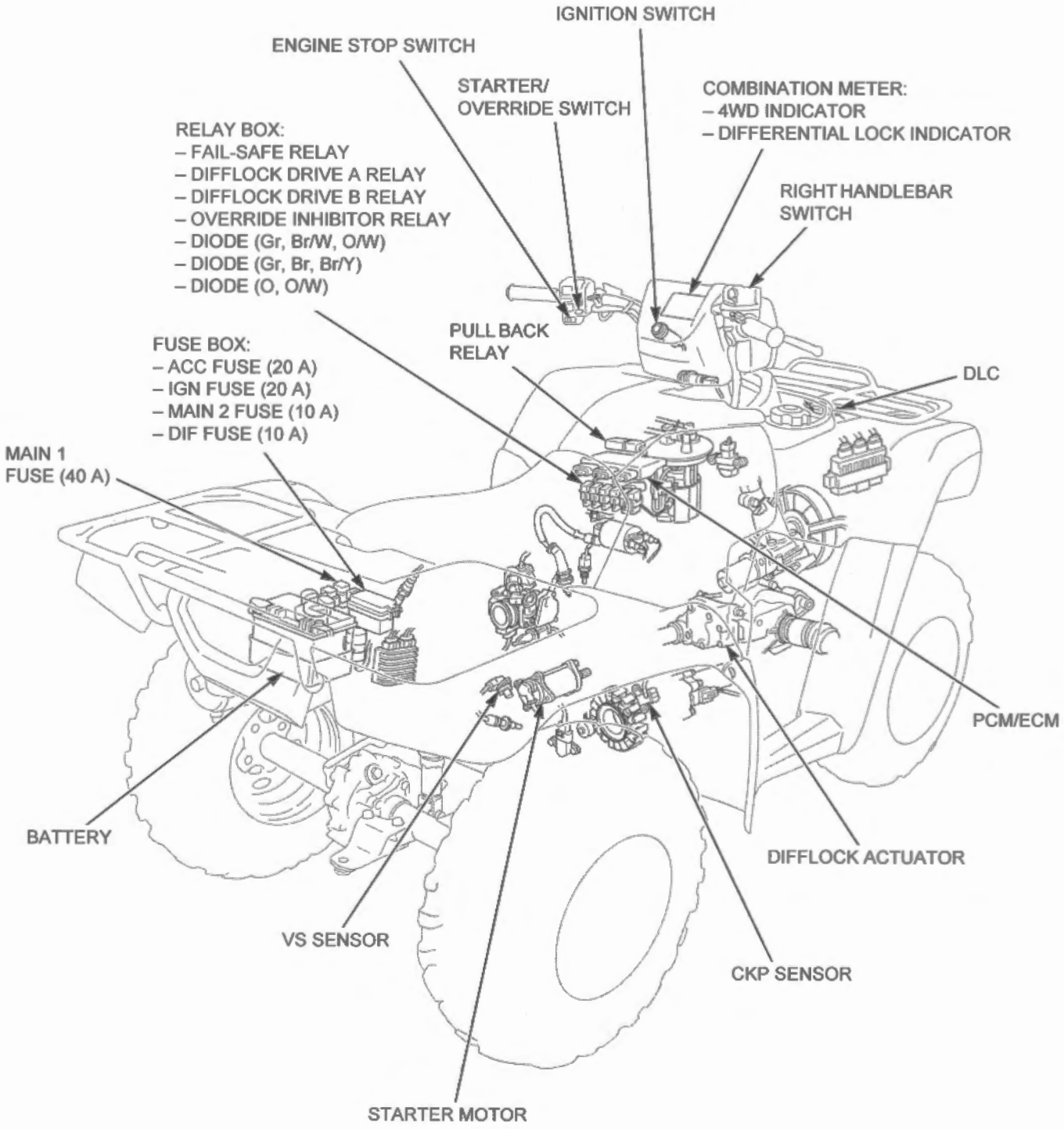
Overheating
- Oil level too low
- Insufficient backlash between ring gear and pinion gear

MECHANICAL SYSTEM COMPONENTS

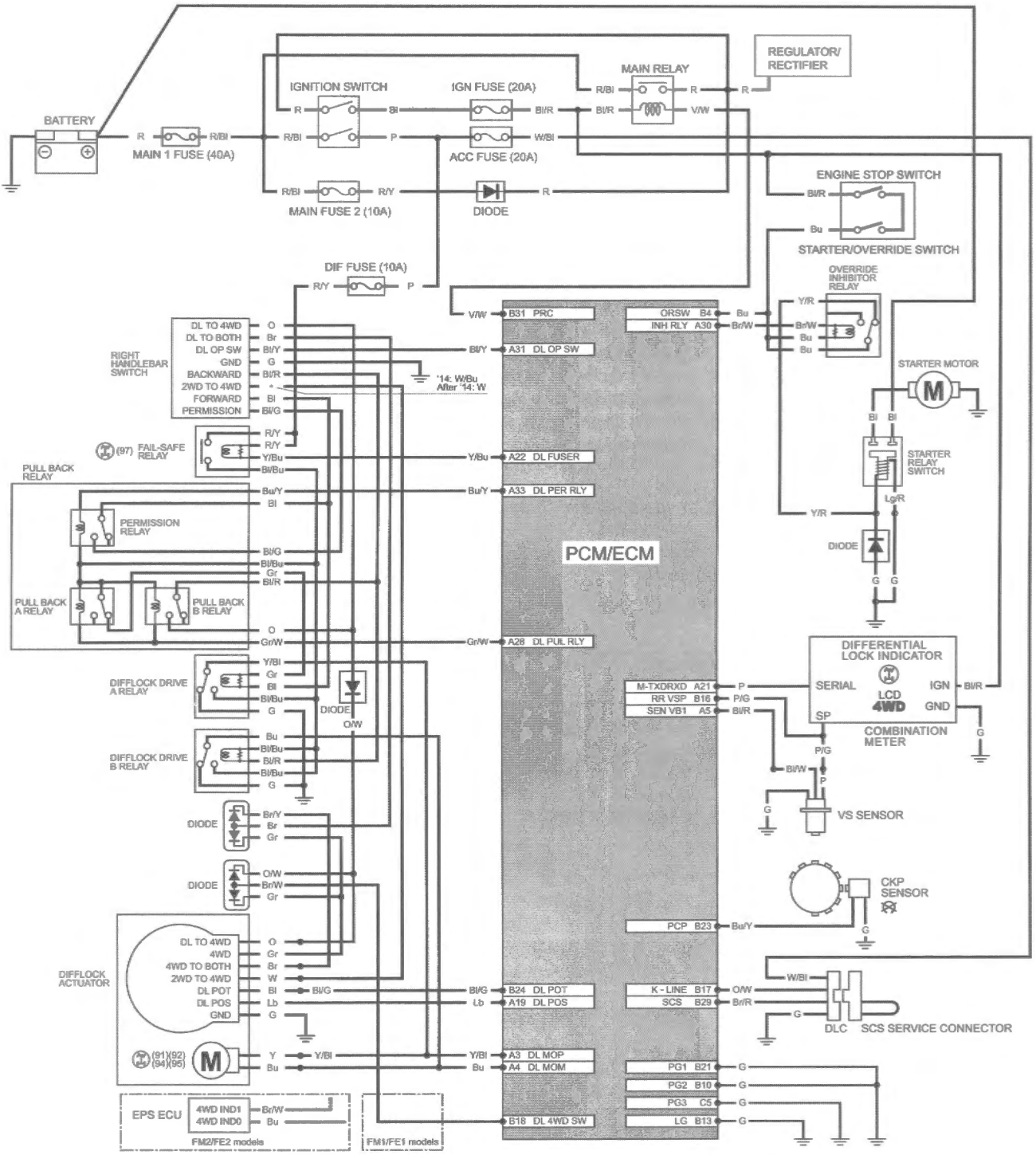


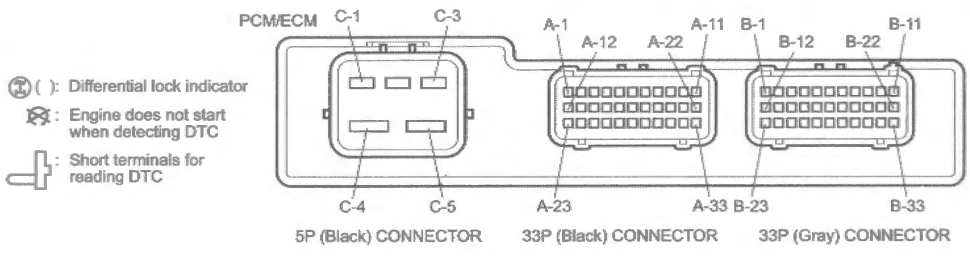
ELECTRICAL SYSTEM COMPONENT LOCATION

'14 model shown:



DIFFERENTIAL LOCK SYSTEM DIAGRAM





( ): Differential lock indicator

: Engine does not start when detecting DTC

: Short terminals for reading DTC

BEFORE TROUBLESHOOTING

NOTE:

- If the ATV has any differential lock system trouble, the differential lock indicator and 4WD indicator blink to indicate the DTC (Diagnostic Trouble Code) (page 21-11).
- Check the DTC and refer to the DTC index and begin the appropriate troubleshooting procedure (page 21-13).
- If there are no DTC stored in the PCM/ECM memory, do the troubleshooting as "Symptom Troubleshooting" (page 21-10).

PRELIMINARY DIFFERENTIAL LOCK SYSTEM INSPECTION

Inspect the following before diagnosing the system.

– Make sure the battery is fully charged and in good condition (page 23-5)
– Check for a blown DIF fuse (10 A).

SYMPTOM TROUBLESHOOTING

Symptom	Diagnosis	Also check for
The drive mode cannot be shifted	1. Inspect the differential lock motor (page 21-21) 2. Inspect the relays (page 21-23) 3. Inspect the diodes (page 21-24) 4. Inspect the actuator switch (page 21-21) 5. Inspect the right handlebar switch (page 21-23) 6. Inspect the front final drive (page 21-37)	Open circuit in related wire
Gear position indicator blinks "–" constantly, MIL, reverse, neutral, differential lock and high coolant temperature indicators come on (No DTC set)	Inspect the serial communication line (page 24-9)	–
Differential lock indicator and 4WD indicator stays on, but no DTC is set	Inspect the MIL circuit (page 4-40)	Short circuit in the DLC related wire
Override does not work	1. Inspect the override inhibitor relay (page 21-23) 2. Inspect the starter/override switch (page 24-15) 3. Check the ESP DTC 11-1 (page 25-2)	Open circuit in related wire

DIFFERENTIAL LOCK SYSTEM TROUBLESHOOTING INFORMATION

GENERAL TROUBLESHOOTING

- Refer to "GENERAL TROUBLESHOOTING" in "PGM-FI system" (page 4-12).

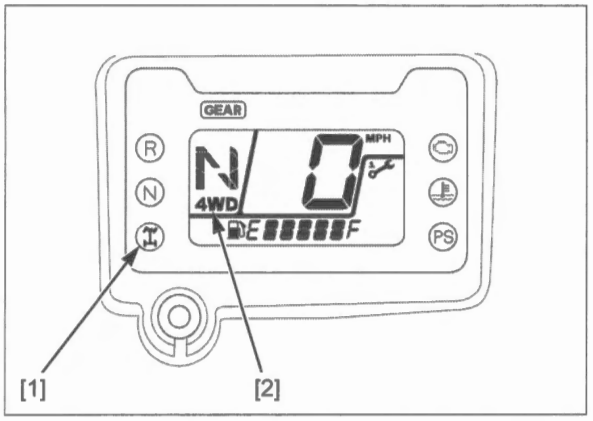
SYSTEM DESCRIPTION

SELF-DIAGNOSIS SYSTEM

The differential lock system is equipped with the self-diagnostic system. When any abnormality occurs in the system, the PCM/ECM turns on the differential lock indicator and 4WD indicator and stores a DTC in its erasable memory.

Differential lock and 4WD Indicator Blink Pattern

- If the MCS is not available, DTC can be read from the PCM/ECM memory by the differential lock indicator [1] and 4WD indicator [2] blink pattern.
- The number of differential lock and 4WD indicator blinks is the equivalent to the main code of the DTC (the sub code cannot be displayed by the differential lock and 4WD indicators).
- The differential lock and 4WD indicators will blink the current DTC, in case the PCM/ECM detects the problem at present, when the ignition switch is ON or idling. The differential lock and 4WD indicators will stay ON when driving.
- The differential lock and 4WD indicators have two types of blinks, a long blink and short blink. The long blinking lasts for 1.2 seconds, the short blinking lasts for 0.4 seconds. One long blink is the equivalent of ten short blinks. For example, when two long blinks are followed by nine short blinks, the DTC is 29 (two long blinks = 20 blinks, plus nine short blinks).
- When the PCM/ECM stores more than one DTC, the differential lock and 4WD indicators will indicate them by blinking in the order from the lowest number to highest number.



Differential lock and 4WD indicators Check

When the ignition switch is turned ON, the differential lock and 4WD indicators will stay on for a few seconds, then go off. If the differential lock and 4WD indicators do not come on, inspect the combination meter (page 24-7).

CURRENT DTC/STORED DTC

The DTC is indicated in two ways according to the failure status.

- In case the PCM/ECM detects the problem at present, the differential lock and 4WD indicators will come on and the differential lock and 4WD indicators will start to blink its DTC. It is possible to readout the differential lock and 4WD indicator blink pattern as the current DTC.
- In case the PCM/ECM does not detect any problem at present but has a problem stored in its memory, the differential lock and 4WD indicators will not come on and blink. If it is necessary to retrieve the past problem, readout the stored DTC by following the DTC readout procedure (page 4-13).

MCS INFORMATION

- Refer to "MCS INFORMATION" in "PGM-FI system" (page 4-13).

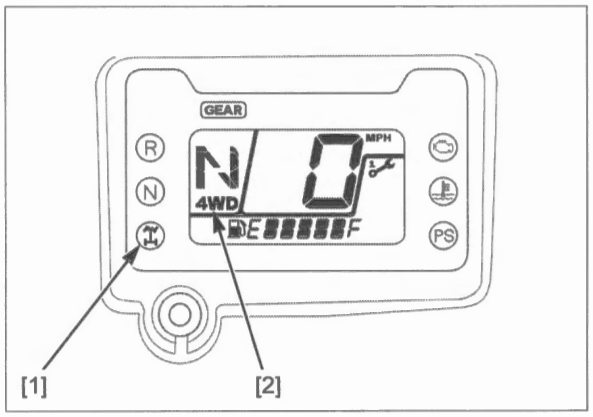
DTC READOUT

- When the ignition switch is turned ON, the differential lock indicator [1] and 4WD indicator [2] will stay on for a few seconds, then go off.
- After performing diagnostic troubleshooting, erase the problem code(s) (page 4-14) and test-ride the vehicle to be sure that the problem(s) have been removed.

If the differential lock and 4WD indicators stay on or blink, connect the MCS to the DLC (page 4-13).

Read the DTC, stored data and follow the troubleshooting index (page 4-16).

To read the DTC with the differential lock and 4WD indicators blinking, refer to the following procedure.



Reading DTC with the differential lock and 4WD indicator

Start the engine and let it idle. Read the differential lock and 4WD indicator blinking that is indicated as the current DTC and refer to the troubleshooting index (page 21-13).

When retrieving the stored DTC, refer to the following procedure.

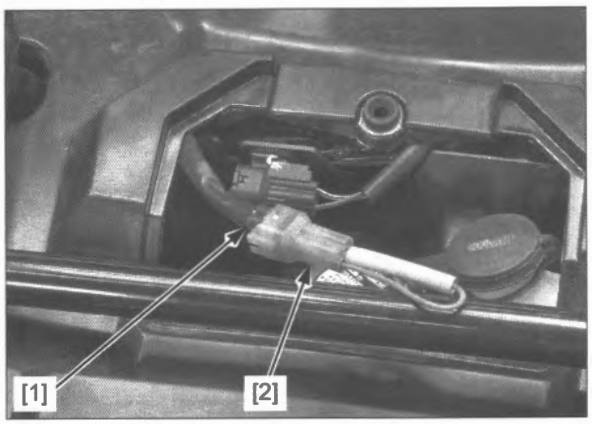
Disconnect the DLC (page 4-13).

Short the DLC [1] terminals using the special tool.

TOOL:
[2] SCS service connector 070PZ-ZY30100

Connection: Brown/red – Green

Turn the ignition switch ON, read, note the differential lock and 4WD indicator blinks and refer to the troubleshooting index (page 21-13).



NOTE:
- If the PCM/ECM has any DTC in its memory, the differential lock and 4WD indicators will start blinking.

ERASING DTC

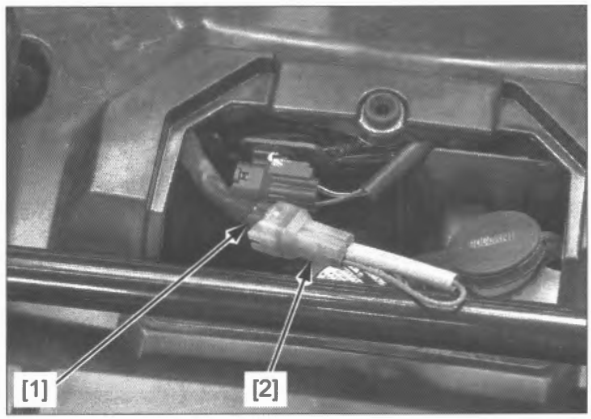
NOTE:
- When erasing the differential lock DTC as follows, the PGM-FI DTC and ESP DTC would also be erased at the same time, check the MIL and gear position indicator blinks and troubleshoot the PGM-FI and ESP systems before readout/erasing the differential lock DTC.

How to erase the DTC without MCS

1. Disconnect the DLC (page 4-13).
2. Short the DLC [1] terminals using the special tool.

   TOOL:
   [2] SCS service connector 070PZ-ZY30100

   Connection: Brown/red – Green
3. Turn the ignition switch ON.
4. Remove the special tool from the DLC.
5. The differential lock and 4WD indicators will come on for approximately 5 seconds. While the differential lock and 4WD indicators come on, short the DLC terminals again with the special tool. The self-diagnostic memory is erased if the malfunction indicator goes off and starts blinking.



NOTE:
- The DLC must be shorted while the differential lock and 4WD indicators come on. If not, the differential lock and 4WD indicators will not start blinking.
- Note that the self-diagnostic memory cannot be erased if the ignition switch is turned OFF before the differential lock and 4WD indicators start blinking.

CIRCUIT INSPECTION

- Refer to "INSPECTION AT PCM/ECM CONNECTOR" information in "PGM-FI system" (page 4-14).

DIFFERENTIAL LOCK DTC INDEX

NOTE:

- When the differential lock indicator is blinking constantly (and gear position indicator continuously blinks "–", MIL, reverse, neutral, differential lock and high coolant temperature indicators come on), but no DTC is indicated or retrievable, check the serial communication line (page 24-9).
- If not using the MCS, perform all inspections according to the relevant main code.

DTC	Function Failure	Symptom/Fail-safe function	Refer to
91-1	Differential lock motor continuous operation (more than 3.2 seconds) in positive rotation • Differential lock system parts or its circuit malfunction • Faulty PCM/ECM	• Differential lock/4WD indicators blink/Disables differential lock system	21-14
91-2	Differential lock motor continuous operation (more than 3.2 seconds) in negative rotation • Differential lock system parts or its circuit malfunction • Faulty PCM/ECM	• Differential lock/4WD indicators blink/Disables differential lock system	21-14
92-1	Differential lock motor both terminals high voltage (more than 2.99 V) • Differential lock system parts or its circuit malfunction • Faulty PCM/ECM	• Differential lock/4WD indicators blink/Disables differential lock system	21-14
94-1	Unusual voltage input pattern on differential lock motor terminal • Differential lock system parts or its circuit malfunction • Faulty PCM/ECM	• Differential lock/4WD indicators blink/Disables differential lock system	21-14
95-1	Differential lock motor operation in negative rotation without operating the pull back relay in changing to differential lock • Differential lock system parts or its circuit malfunction • Faulty PCM/ECM	• Differential lock/4WD indicators blink/Disables differential lock system	21-14
97-1	Fail-safe relay stuck ON • Fail-safe relay or its circuit malfunction • Faulty PCM/ECM	• Differential lock/4WD indicators blink/Disables differential lock system	21-19

DTC TROUBLESHOOTING

DTC 91-1, 91-2, 92-1, 94-1, 95-1: Differential Lock Motor/Control System Malfunction

NOTE:

- Before starting the inspection, check for loose or poor contact on the difflock actuator 10P (Gray) connector and PCM/ECM 33P connectors, and recheck the DTC.

1. **Relays Inspection**

   Inspect the following relays (page 21-23):

   – difflock drive A relay
   – difflock drive B relay
   – pull back relay

   Are the relays normal?

   YES – GO TO STEP 2.

   NO – Faulty difflock drive A, B and/or pull back relay.

2. **Difflock Drive A/B Relay Coil Ground Line Short Circuit Inspection**

   Remove the difflock drive A and B relays (page 21-23).

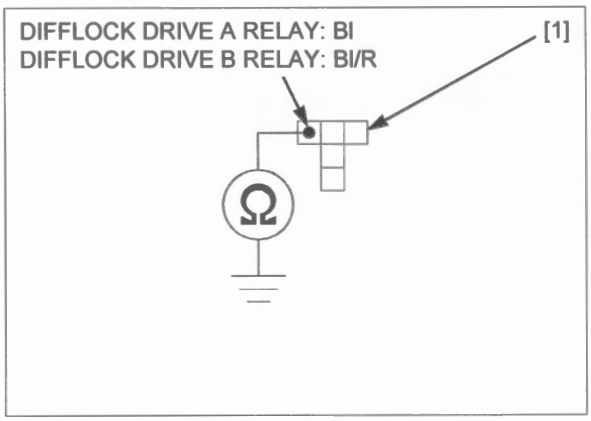
   Check for continuity between the wire harness side difflock drive A/B relay socket [1] terminal and ground.

   Connection:
   Difflock drive A relay: Black – Ground
   Difflock drive B relay: Black/red – Ground

   Is there continuity?

   YES – • Short circuit in Black wire between the PCM/ECM and difflock drive A relay socket.
   • Short circuit in Black/red wire between the PCM/ECM and difflock drive B relay socket.

   NO – GO TO STEP 3.



3. **Pull back/Permission Relay Coil Ground Line Short Circuit Inspection**

   Remove the pull back relay (page 21-20).

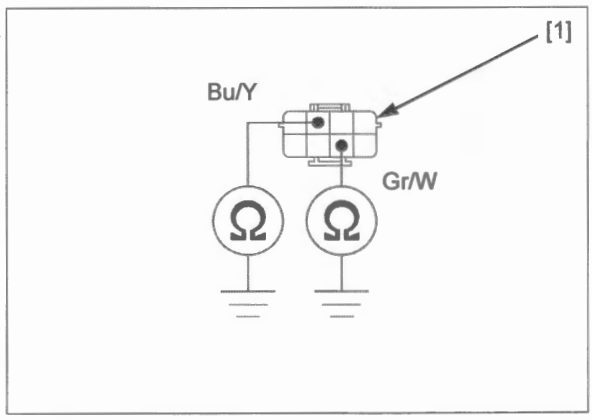
   Check for continuity between the wire harness side pull back relay 8P (Gray) connector [1] terminal and ground.

   Connection: Blue/yellow – Ground
   Gray/white – Ground

   Is there continuity?

   YES – • Short circuit in Blue/yellow wire between the PCM/ECM and pull back relay 8P (Gray) connector.
   • Short circuit in Gray/white wire between the PCM/ECM and pull back relay 8P (Gray) connector.

   NO – GO TO STEP 4.



4. Differential Lock Motor Inspection

Inspect the differential lock motor (page 21-21).

Is the differential lock motor normal?

YES – GO TO STEP 5.

NO – Faulty difflock actuator (differential lock motor)

5. Drive Mode Verification

Support the vehicle using a hoist or equivalent and raise the front wheels off the ground.
Verify the drive mode by rotating either side of the front wheel.

Wheel condition	Drive mode
• The wheel can rotate lightly (and the rear tires will not rotate if rear wheels are also raised).	2WD
• The wheel can rotate heavily (and the rear tires will also rotate if rear wheels are also raised). • The other side of the front wheel rotates in negative rotation if rear tires are held stationary.	4WD
• The wheel cannot rotate (The wheel can rotate heavily and the rear tires will also rotate if rear wheels are also raised). • Both side of the front wheel rotate simultaneously in the same rotation direction.	DIFFLOCK

Is the drive mode verified?

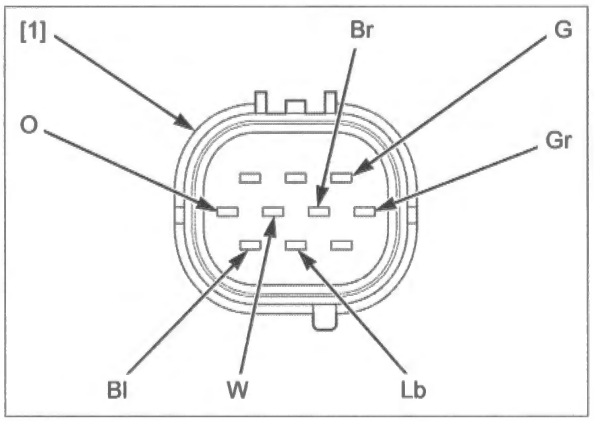
YES – GO TO STEP 6.

NO – Inspect the front final drive (page 21-32).

6. Actuator Switch Position Verification

Disconnect the difflock actuator 10 P (Gray) connector (page 21-22).

Verify the actuator switch position by checking for continuity between the actuator side 10P (Gray) connector [1] "○" terminals. There should be continuity between "○" terminals.



Drive mode	Color							Actuator switch position
	O	W	Br	Gr	Bl	G	Lb	
2WD		○				○		2WD
		○	○			○		
2WD		○	○			○		2WD – 4WD
4WD		○	○			○		4WD
		○	○	○		○		
				○		○		
	○		○	○		○		
	○		○			○		
4WD	○		○			○		4WD – DIFFLOCK
	○		○		○	○		
	○		○		○	○	○	
DIFF LOCK	○		○		○	○	○	DIFFLOCK
	○				○	○	○	

Is the switch position verified?

YES – GO TO STEP 7.

NO – Faulty difflock actuator (actuator switch).

7. Malfunction Circuit Verification

Install the relays (page 21-23).
Connect the difflock actuator 10P (Gray) connector.
Turn the ignition switch ON.

Check the 4WD and differential lock indicators and verify the malfunction circuit, then inspect each circuit.

4WD indicator	Differential lock indicator	Actuator switch position	Reference of malfunction circuit inspection
–	–	2WD	–
		2WD – 4WD	
		4WD	• GO TO STEP 8.
		4WD – DIFFLOCK	• GO TO STEP 8. • GO TO STEP 12.
		DIFFLOCK	• GO TO STEP 8. • GO TO STEP 12. • GO TO STEP 10.
○	–	2WD	• GO TO STEP 9.
		2WD – 4WD	
		4WD	–
		4WD – DIFFLOCK	• GO TO STEP 12.
		DIFFLOCK	• GO TO STEP 12. • GO TO STEP 10.
○	BLINK	2WD	• GO TO STEP 9.
		2WD – 4WD	• GO TO STEP 13.
		4WD	• GO TO STEP 13.
		4WD – DIFFLOCK	–
		DIFFLOCK	• GO TO STEP 10.
○	○	2WD	• GO TO STEP 11.
		2WD – 4WD	
		4WD	• GO TO STEP 11.
		4WD – DIFFLOCK	• GO TO STEP 13.
		DIFFLOCK	–

Is the circuit normal?

YES – GO TO STEP 14.

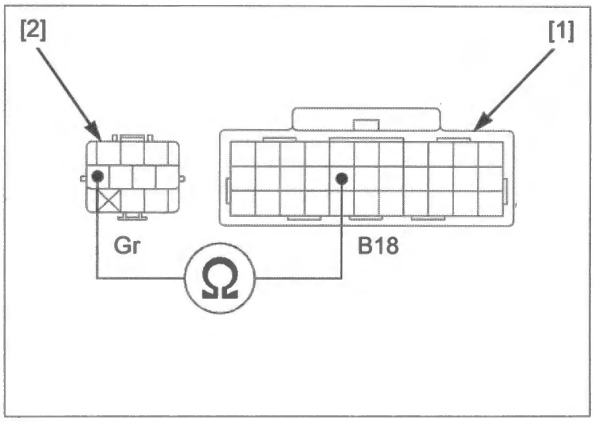
NO – Repair or replace the wire.

8. 4WD Position Detection Line Open Circuit Inspection

Turn the ignition switch OFF.
Disconnect the difflock actuator 10P (Gray) connector.
Disconnect the PCM/ECM 33P (Gray) connector (page 4-45).

Check for continuity between the wire harness side PCM/ECM 33P (Gray) connector [1] and difflock actuator 10P (Gray) connector [2] terminals.

Connection: B18 – Gray



TOOL:
Pin Probe Male (2 pack) 07ZAJ-RDJA110

Is there continuity?

YES – GO TO STEP 7.

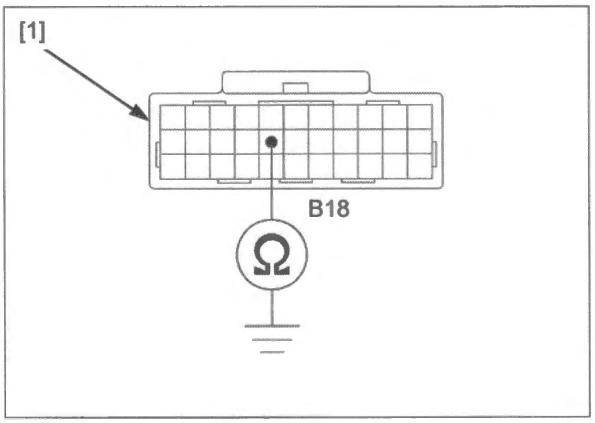
NO – • Continuity should be in one direction through the diode. Interchange the test probe positive and negative probes and recheck. If there is continuity GO TO STEP 7.
- Open circuit in Blue (FM2/FM6/FM7/FE2/FA6/FA7), Brown/white, and/or Gray wire between the PCM/ECM and difflock actuator.
- Faulty diode (Gray, Brown/white, Orange/white).

9. 4WD Position Detection Line Short Circuit Inspection

Turn the ignition switch OFF.
Disconnect the difflock actuator 10P (Gray) connector.

Check for continuity between the wire harness side difflock actuator 10P (Gray) connector [1] terminal and ground.

Connection: B18 – Ground



TOOL:
Pin Probe Male (2 pack) 07ZAJ-RDJA110

Is there continuity?

YES – • Continuity should be in one direction through the diode. Change the test probe positive and negative probes and recheck.
- Short circuit in Blue (FM2/FM6/FM7/FE2/FA6/FA7), Brown/white, and/or Gray wire between the PCM/ECM and difflock actuator.

NO – GO TO STEP 7.

10. Differential Lock Position Detection Line Open Circuit Inspection

Turn the ignition switch OFF.
Disconnect the difflock actuator 10P (Gray) connector.
Disconnect the PCM/ECM 33P (Gray) connector (page 4-45).

Check for continuity between the wire harness side PCM/ECM 33P (Gray) connector [1] and difflock actuator 10P (Gray) connector [2] terminals.

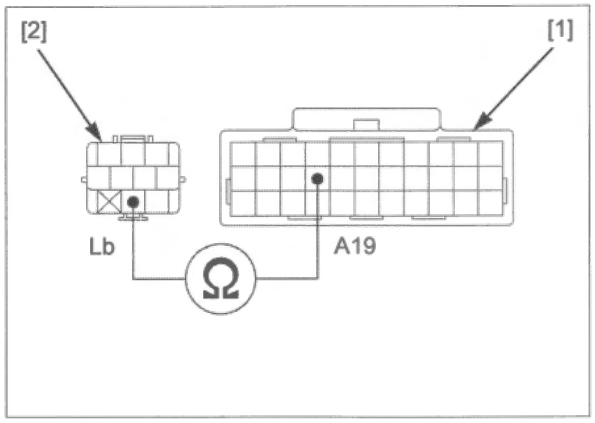
Connection: A19 – Light blue

TOOL:
Pin Probe Male (2 pack) 07ZAJ-RDJA110

Is there continuity?

YES – GO TO STEP 7.

NO – Open circuit in Light blue wire between the PCM/ECM and difflock actuator.



11. Differential Lock Position Detection Line Short Circuit Inspection

Turn the ignition switch OFF.
Disconnect the difflock actuator 10P (Gray) connector.

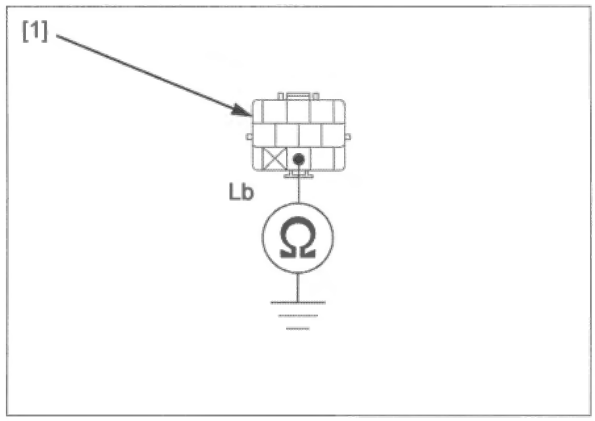
Check for continuity between the wire harness side difflock actuator 10P (Gray) connector [1] terminal and ground.

Connection: Light blue – Ground

Is there continuity?

YES – Short circuit in Light blue wire between the PCM/ECM and difflock actuator.

NO – GO TO STEP 7.



12. 4WD to Differential Lock Position Detection Line Open Circuit Inspection

Turn the ignition switch OFF.
Disconnect the difflock actuator 10P (Gray) connector.
Disconnect the PCM/ECM 33P (Gray) connector (page 4-45).

Check for continuity between the wire harness side PCM/ECM 33P (Gray) connector [1] and difflock actuator 10P (Gray) connector [2] terminals.

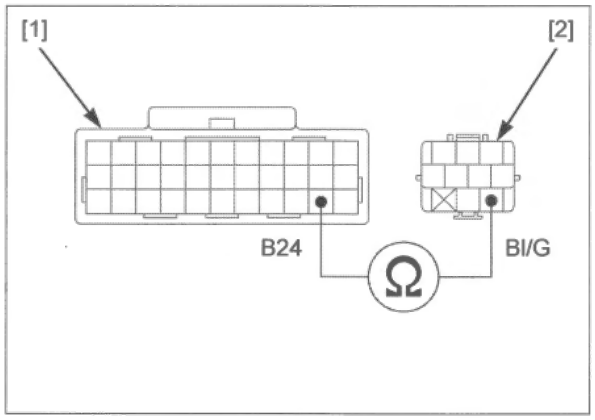
Connection: B24 – Black/green

TOOL:
Pin Probe Male (2 pack) 07ZAJ-RDJA110

Is there continuity?

YES – GO TO STEP 7.

NO – Open circuit in Black/green wire between the PCM/ECM and difflock actuator.



13. 4WD to Differential Lock Position Detection Line Short Circuit Inspection

Turn the ignition switch OFF.
Disconnect the difflock actuator 10P (Gray) connector.

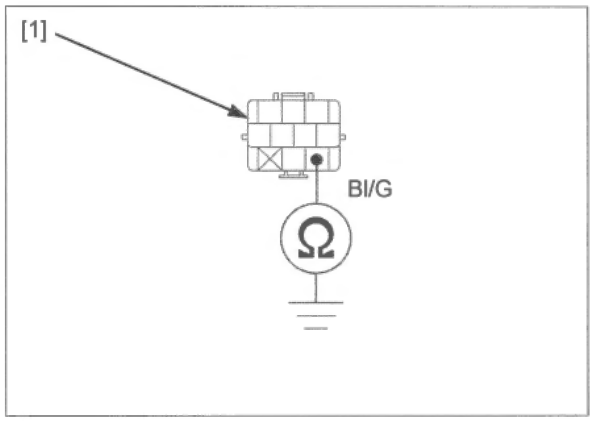
Check for continuity between the wire harness side difflock actuator 10P (Gray) connector [1] terminal and ground.

Connection: Black/green – Ground

Is there continuity?

YES – Short circuit in Black/green wire between the PCM/ECM and difflock actuator.

NO – GO TO STEP 7.



14. Right handlebar switch Inspection

Check the right handlebar switch (page 21-23).

Is the right handlebar switch normal?

YES – • DTC 91-1-91-2: Inspect the front final drive (page 21-37).
• Replace the PCM/ECM with a known good one (page 4-45), and recheck.

NO – Faulty right handlebar switch.

DTC 97-1: Fail-safe relay stuck ON

NOTE:

- Before starting the inspection, check for loose or poor contact on the difflock actuator 10P (Gray) connector and PCM/ECM 33P connectors, and recheck the DTC.

1. Fail-safe Relay Inspection

Inspect the fail-safe relay (page 21-23):

Is the fail-safe relay normal?

YES – Replace the PCM with a known good one (page 4-45), and recheck.

NO – Faulty fail-safe relay.

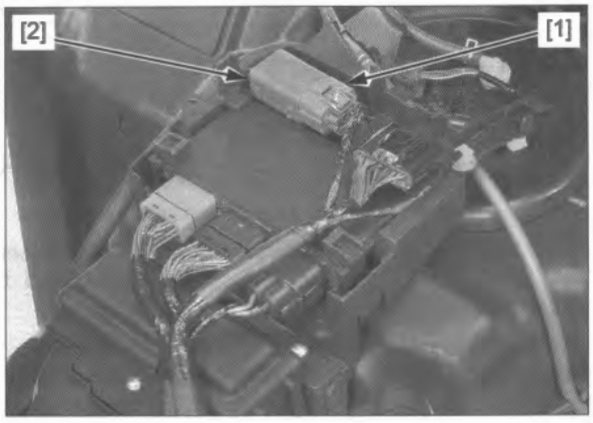
PULL BACK RELAY

INSPECTION

Remove the tank cover assembly (page 2-4).

Turn the ignition switch OFF.

Remove the pull back relay 8P (Gray) connector [1] and disconnect the relay [2].



PERMISSION/PULL BACK B RELAY

Connect an ohmmeter to the pull back relay side 8P connector [1] terminals as shown.

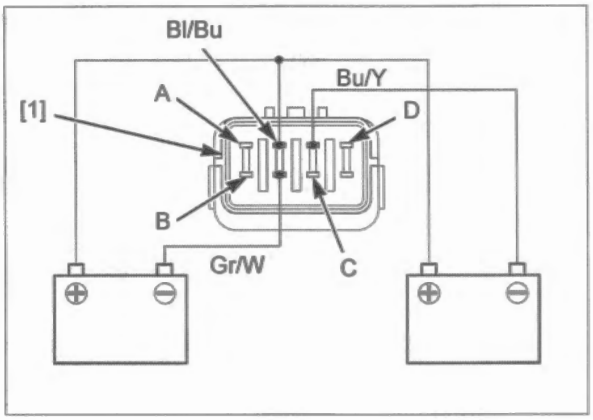
Connection:
Permission relay: A (Black/green) – D (Black)
Pull back B relay: B (Orange) – C (Black/red)

Connect a 12 V battery to the pull back relay side 8P connector terminals as shown.

Connection:
Permission relay: Black/blue – Blue/yellow
Pull back B relay: Black/blue – Gray/white

There should be continuity with the battery connected and no continuity with the battery disconnected.

If the test result is abnormal, replace the pull back relay.



PULL BACK A RELAY

Connect a voltmeter to the pull back relay side 8P connector [1] terminal and battery as shown.

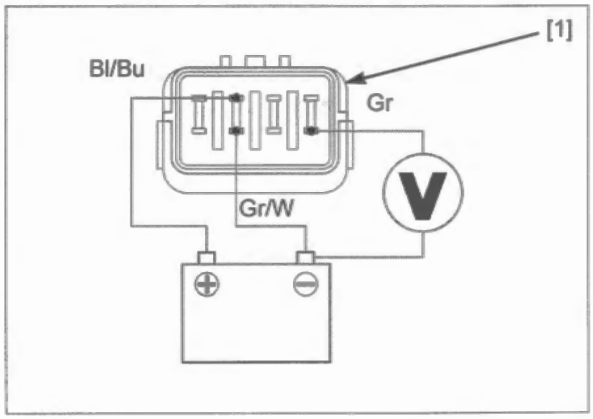
Connection: Gray – Battery negative (–) terminal

Connect a 12 V battery to the pull back relay side 8P connector terminals as shown.

Connection: Black/blue – Gray/white

There should be no voltage with the battery connected and battery voltage with the battery Gray/white line disconnected.

If the test result is abnormal, replace the pull back relay.



DIFFLOCK ACTUATOR

ACTUATOR SWITCH INSPECTION

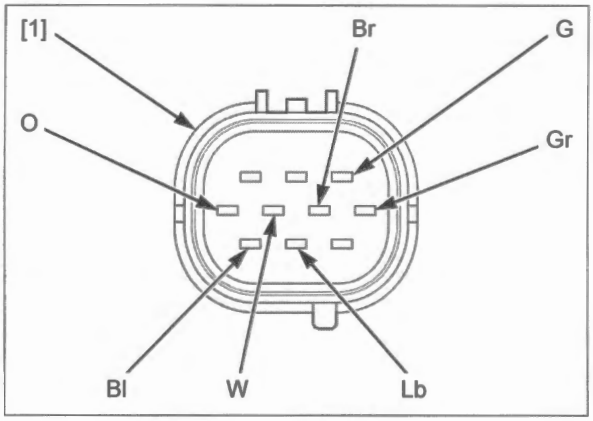
Support the vehicle using a hoist or equivalent and raise the front wheels off the ground.

Verify the drive mode by rotating either side of the front wheel.

Wheel condition	Drive mode
• The wheel can rotate lightly (and the rear tires will not rotate if rear wheels are also raised).	2WD
• The wheel can rotate heavily (and the rear tires will also rotate if rear wheels are also raised). • The other side of the front wheel rotates in negative rotation if rear tires are held stationary.	4WD
• The wheel cannot rotate (The wheel can rotate heavily and the rear tires will also rotate if rear wheels are also raised). • Both side of the front wheel rotate simultaneously in the same rotation direction.	DIFFLOCK

Disconnect the difflock actuator 10 P (Gray) connector (page 21-22).

Check for continuity between the actuator side 10P (Gray) connector [1] "O" terminals in each switch position. There should be continuity between "O" terminals.



Drive mode	Color						
	O	W	Br	Gr	Bl	G	Lb
2WD		O				O	
		O	O			O	
4WD		O	O			O	
		O	O	O		O	
				O		O	
	O		O	O		O	
	O		O			O	
	O		O		O	O	
	O		O		O	O	O
DIFFLOCK	O		O		O	O	O
	O				O	O	O

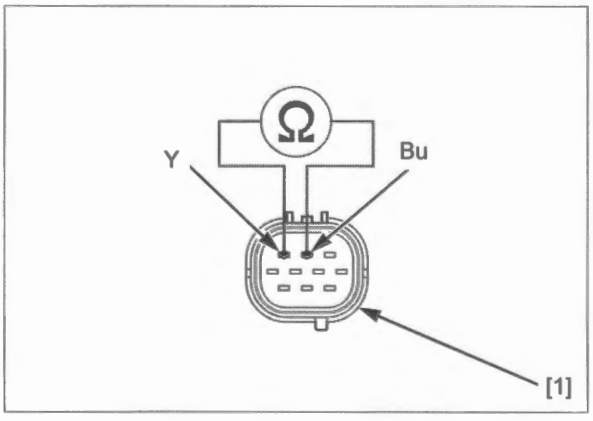
DIFFERENTIAL LOCK MOTOR INSPECTION

Disconnect the difflock actuator 10P (Gray) connector (page 21-22).

Measure the resistance between the actuator side 10P (Gray) connector [1] terminals.

Connection: Yellow – Blue
Standard: 2 – 400 Ω (20 °C/68 °F)

If the resistance is out of specification, replace the difflock actuator (page 21-22).



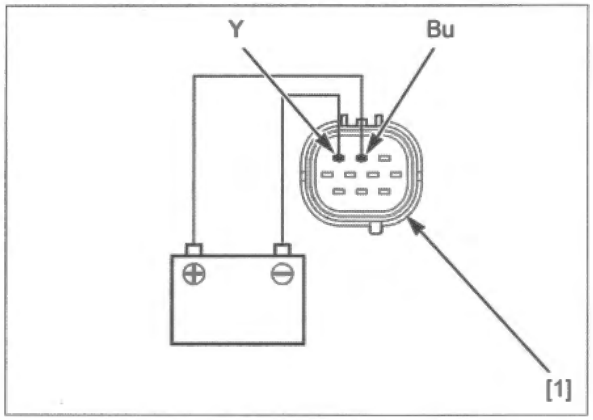
Check the motor operation by connecting a fully charged 12 V battery to the actuator side 10P (Gray) connector [1] terminals.

Connection: Yellow – Blue

If the motor does not turn, interchange the connected battery positive and negative terminals and recheck:

- If the motor turns, the motor is normal.
- If the motor does not turn, replace the difflock actuator (page 21-22).

If the motor turns, check for open or short circuit in Blue, Yellow and/or Yellow/black wires between the difflock actuator and PCM/ECM.

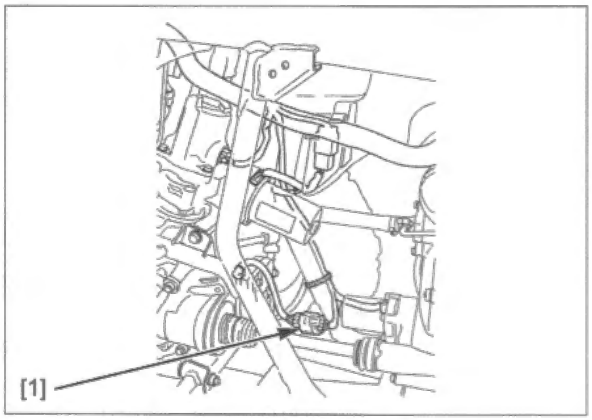


REMOVAL/INSTALLATION

Drain the front differential oil (page 3-21).

Turn the ignition switch OFF.

Remove the difflock actuator 10 P (Gray) connector [1] and disconnect it.



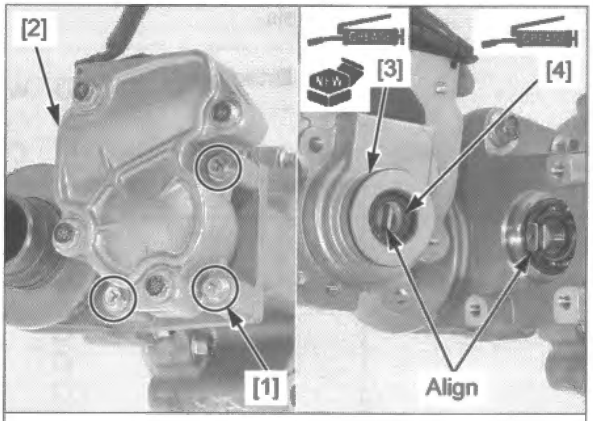
Remove the bolts [1] and difflock actuator [2].
Remove the O-ring [3] from the actuator.

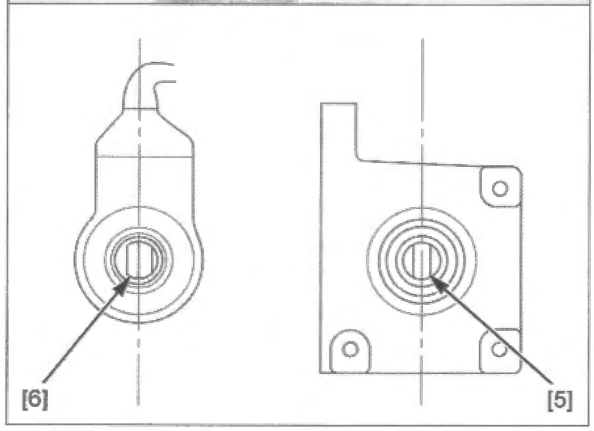
Installation is in the reverse order of removal.

- Always replace the O-ring with a new one.
- Coat a new O-ring with grease.
- Apply grease to the oil seal [4] lips.
- Rotate the screw shaft [5] counterclockwise fully and align the actuator groove [6] with the screw shaft.

TORQUE:
Difflock actuator mounting bolt:
12 N·m (1.2 kgf·m, 9 lbf·ft)

Fill the gear case with the recommended oil (page 3-21).



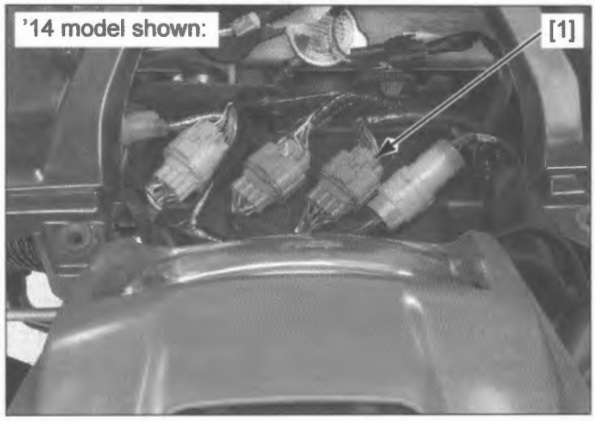


RIGHT HANDLEBAR SWITCH

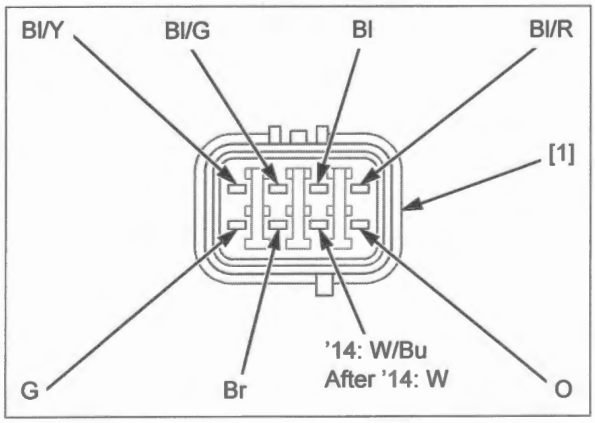
INSPECTION

Lift the front fender (page 24-13).

Remove the right handlebar switch 8P (Orange) connector [1] and disconnect it.



Check for continuity between the switch side 8P (Orange) connector [1] terminals (between the same marks in the chart below) in each switch position.



'14:

SWITCH POSITION	Color							
	Bl/R	O	Bl	W/Bu	Br	Bl/G	Bl/Y	G
2WD	○	○			○			
4WD	△	△	○	○				
DIFFLOCK			○	○	△	△	★	★

After '14:

SWITCH POSITION	Color							
	Bl/R	O	Bl	W	Br	Bl/G	Bl/Y	G
2WD	○	○			○			
4WD	△	△	○	○				
DIFFLOCK			○	○	△	△	★	★

RELAYS

INSPECTION

Remove the PCM/ECM (page 4-45).

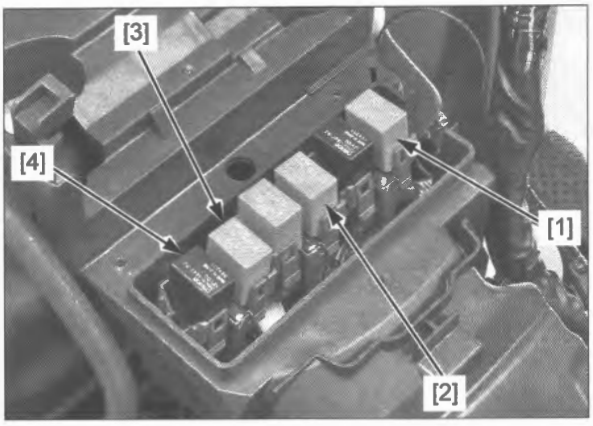
Turn the ignition switch OFF and engine stop switch "⊠".

Remove the screws [1] and relay box lid [2].



Remove the following relays:

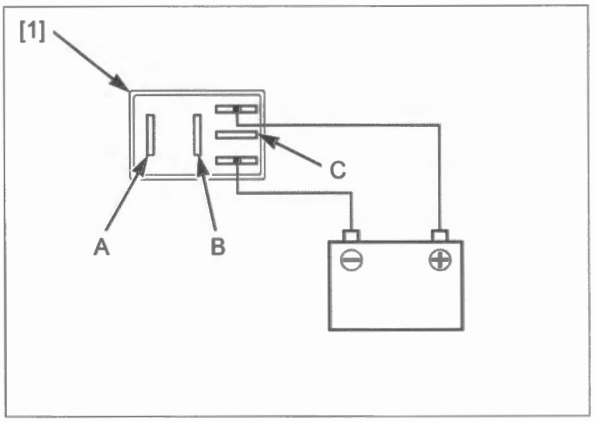
- override inhibitor relay [1]
- difflock drive B relay [2]
- difflock drive A relay [3]
- fail-safe relay [4]



OVERRIDE INHIBITOR RELAY, DIFFLOCK DRIVE A/ B RELAYS

Connect an ohmmeter to the terminals of the relay [1].

Connection: A – B
A – C



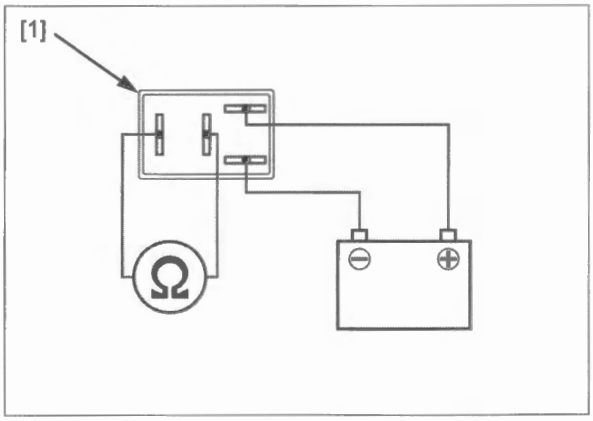
Connect a 12 V battery to the relay terminals as shown.

There should be continuity between the A – B terminals only when the 12 V battery is connected.
If there is no continuity when the 12 V battery is connected, replace the relay.

There should be continuity between the A – C terminals only when the 12 V battery is disconnected.
If there is continuity when the 12 V battery is disconnected, replace the relay.

FAIL-SAFE RELAY

Connect an ohmmeter to the terminals of the relay [1].



Connect a 12 V battery to the relay terminals as shown.

There should be continuity only when the 12 V battery is connected.
If there is no continuity when the 12 V battery is connected, replace the relay.

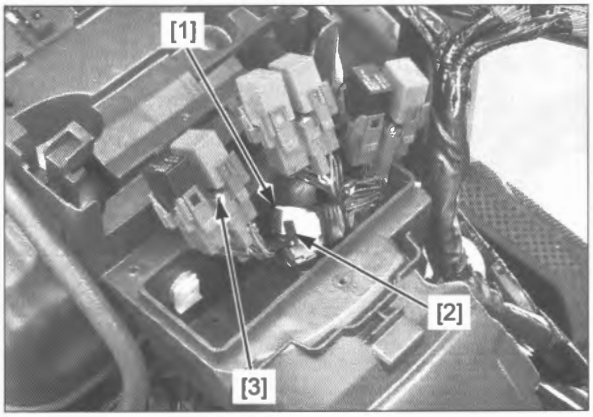
DIODES

Remove the relay box lid (page 21-23).

Turn the ignition switch OFF.

There are the following diodes (color of the connected wire):

- [1] (Gray, Brown/white, Orange/white)
- [2] (Gray, Brown, Brown/yellow)
- [3] (Orange, Orange/white)

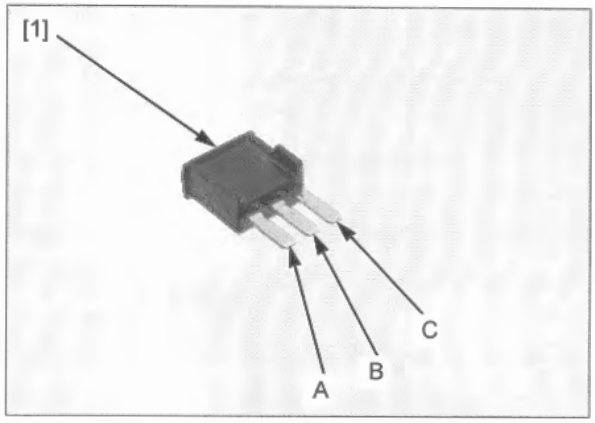


Check for continuity between the terminals of the diode [1].

Connection: B – A
B – C

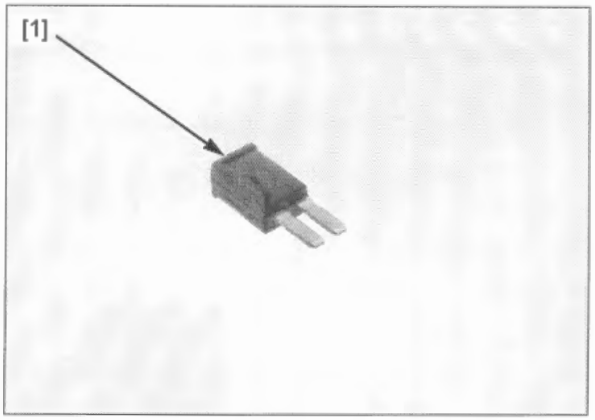
When there is continuity, a small resistance value will register.

If there is continuity in one direction, the diode is normal.



Check for continuity between the terminals of the diode [1].

When there is continuity, a small resistance value will register.
If there is continuity in one direction, the diode is normal.



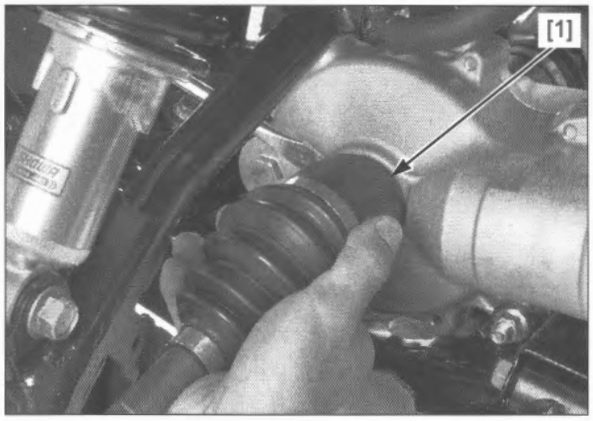
FRONT DRIVE SHAFT

REMOVAL

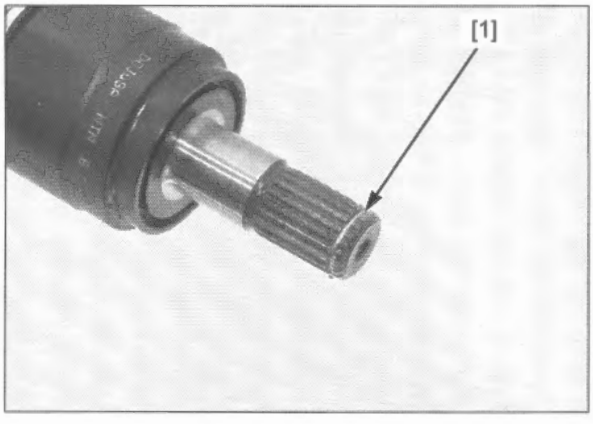
Remove the knuckle (page 18-14).

To prevent damage to the differential oil seal, hold the inboard joint horizontal until the drive shaft is clear of the differential.

Hold the inboard joint [1] of the drive shaft and tug firmly to force the stopper ring on the inboard joint end past the groove while prying with a screwdriver.



Remove the stopper ring [1] from the inboard joint.

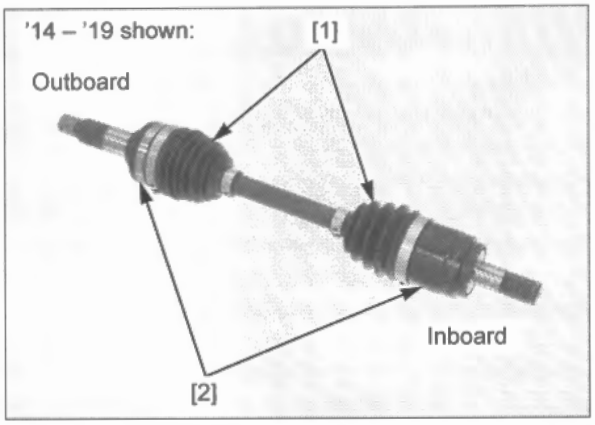


DISASSEMBLY/INSPECTION

Check the boots [1] for cuts or other damage.
Check the drive shaft joints [2] for excessive play or noise by moving the joints in a circular direction.
If the outboard joint seems to be worn or damaged, the drive shaft must be replaced.

NOTE:

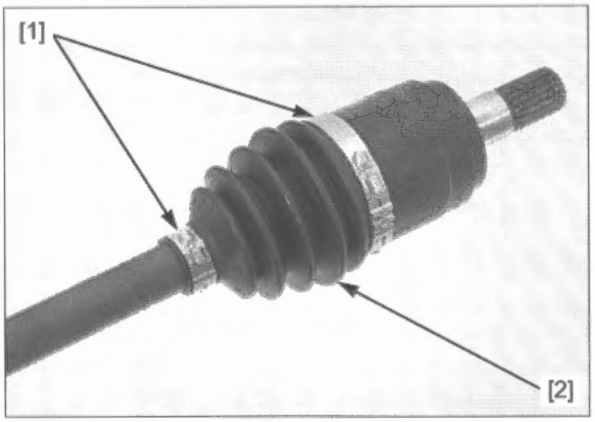
- To replace the outboard boot, first remove the inboard boot as described in following steps.
  Then remove bands and the outboard boot off the inboard end of the shaft.
- The outboard joint cannot be disassembled.



Replace the band with new ones whenever removing them.

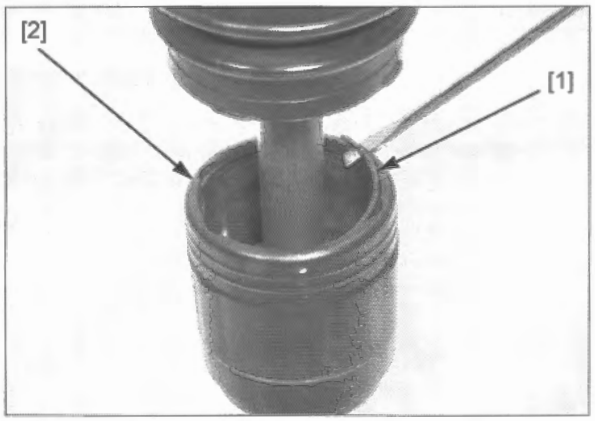
Cut off and remove the boot bands [1] from inboard boot [2].

Remove the boot from the inboard joint.



Remove the following:

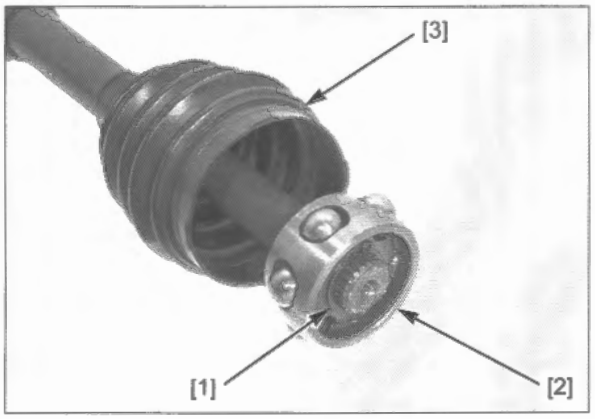
- stopper ring [1]
- inboard joint [2]



'14 – '19 FM and FE models/'15 – '16 FA models:

Remove the following:

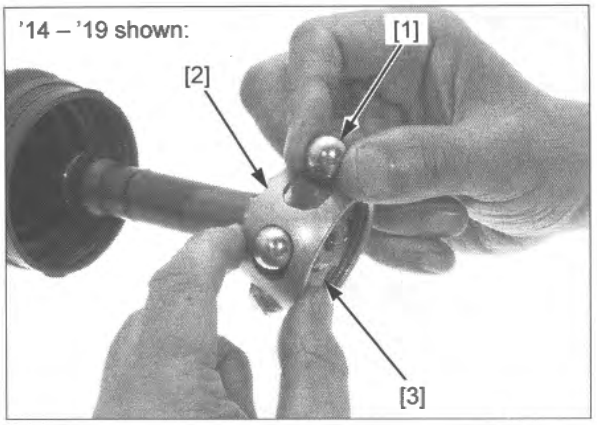
- snap ring [1]
- bearing [2]
- inboard boot [3]



After '16 FA models/After '19 FM and FE models:

Remove the balls [1] from the bearing cage [2] and inner race [3] by tilting the cage as shown.

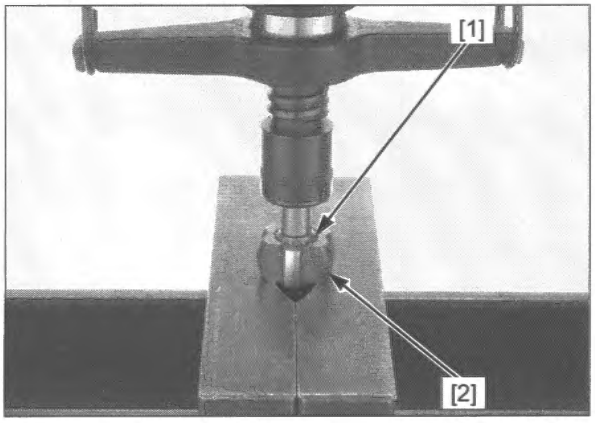
Slide the bearing cage down into the inboard boot.



After '16 FA models/After '19 FM and FE models:

Except U.S.A.:

While holding the drive shaft [1], press it out of the inner race [2] using a suitable tool as shown.



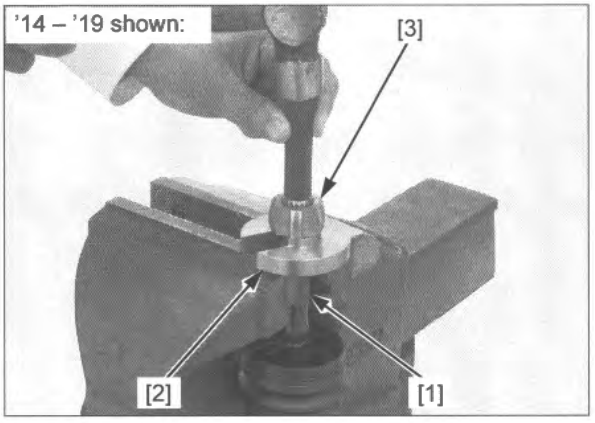
After '16 FA models/After '19 FM and FE models:

U.S.A. only:

Place the drive shaft [1] in a vise using a special tool. Do not tighten the vise onto the shaft.

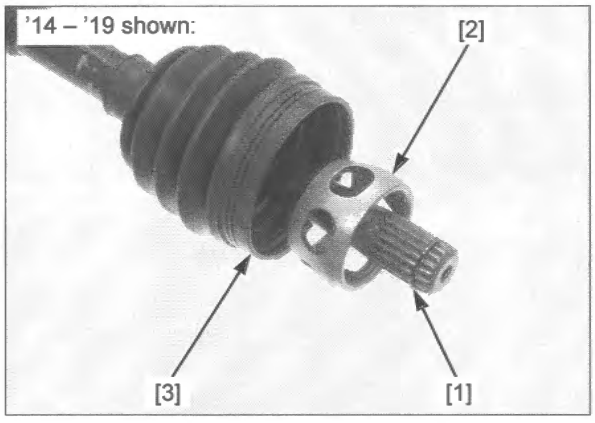
TOOL:
Half shaft disassembly plate [2] 070MF-HR3A100

While holding the drive shaft, drive it out of the inner race [3] using a suitable rod.



After '16 FA models/After '19 FM and FE models:

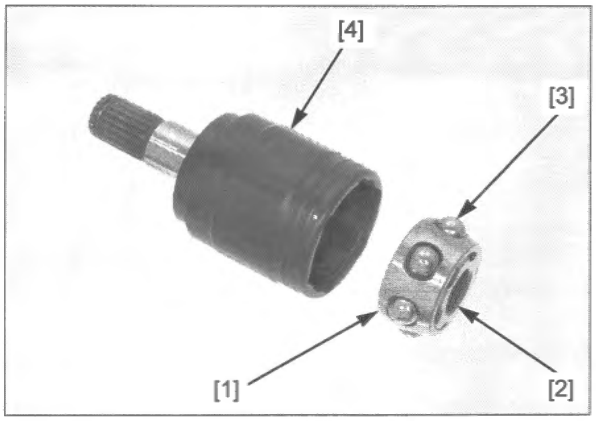
Remove the stopper ring [1], inner race [2] and inboard boot [3] from the drive shaft.



Replace these components as an assembly.

Check the following for wear or damage.

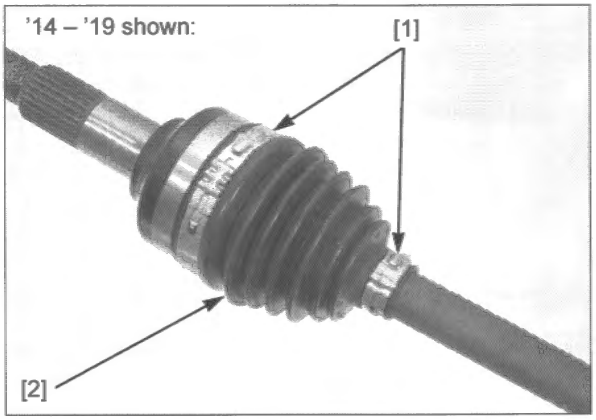
- bearing cage [1]
- race [2]
- steel balls [3]
- inboard joint [4]



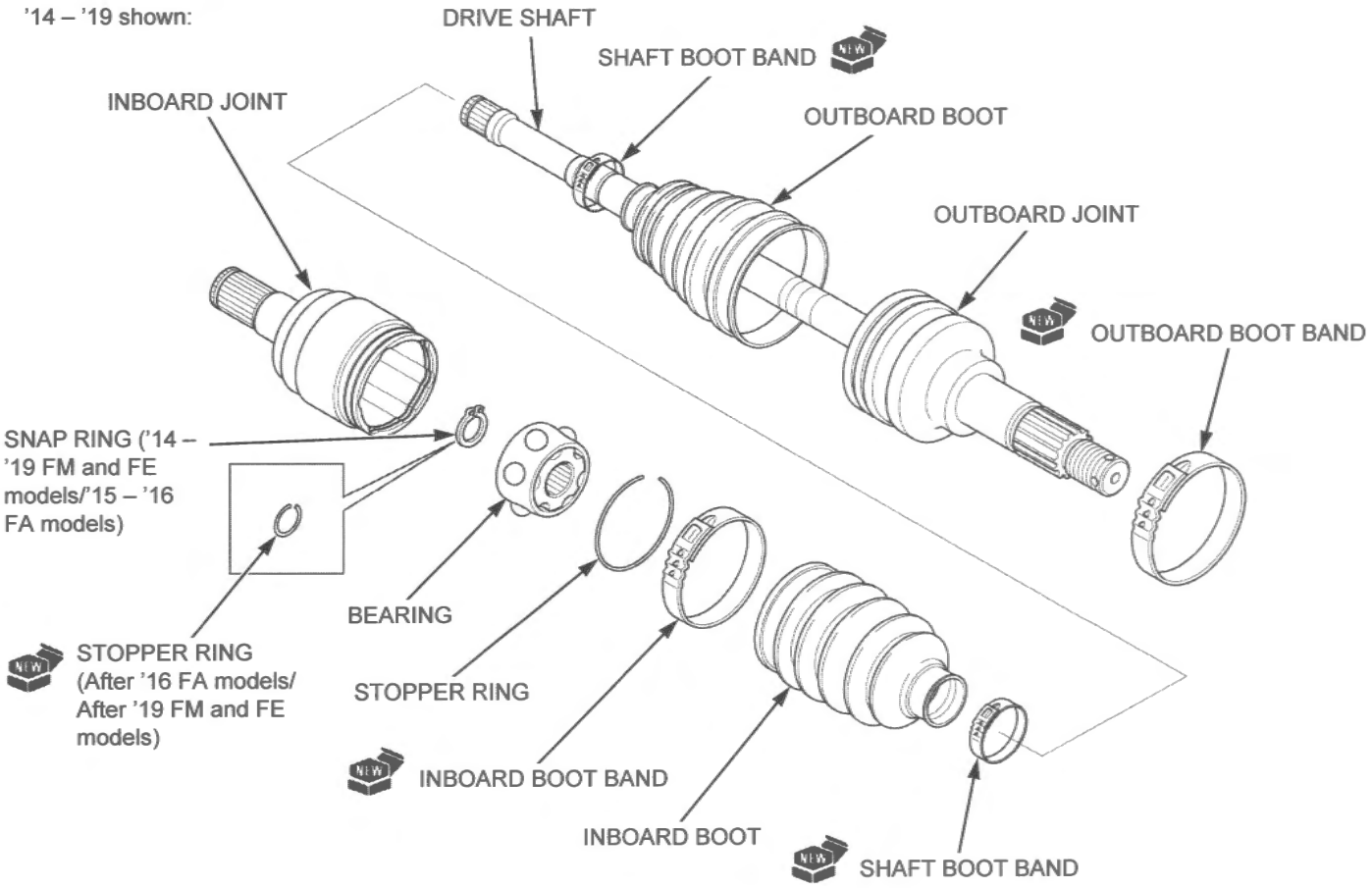
Replace the bands with new ones whenever removing them.

Cut off and remove the boot bands [1] from outboard boot [2].

Remove the outboard boot.

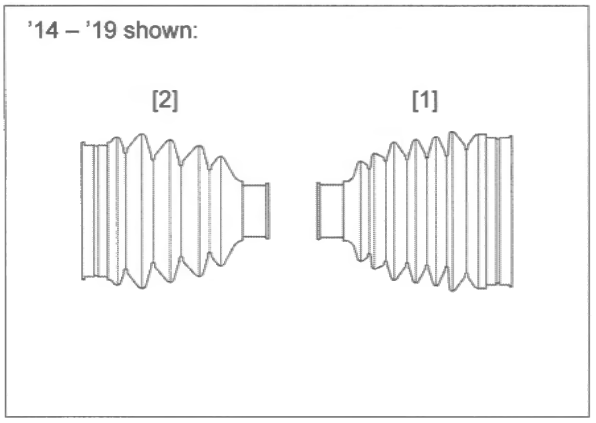


ASSEMBLY



Pack the inboard and outboard joint insides with specified grease.

The outboard boot [1] is larger than the inboard boot [2]. Do not interchange them.



Each band has following identification number [1]. Do not interchange them.

'14 – '19 FM and FE models/'15 – '16 FA models:

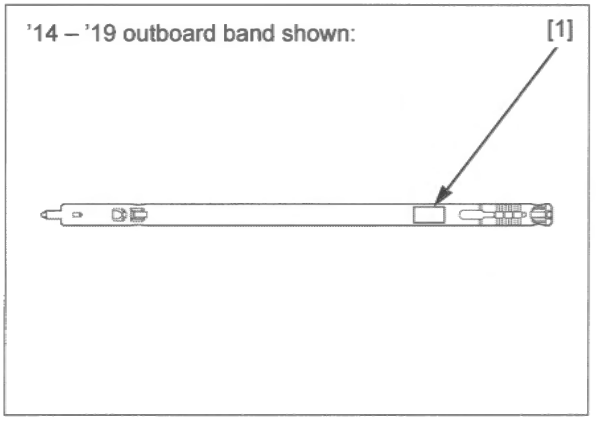
INBOARD SHAFT BOOT BAND:	**78**
INBOARD BOOT BAND:	**77**
OUTBOARD SHAFT BOOT BAND:	**78**
OUTBOARD BOOT BAND:	**79**

17' – '19 FA models:

INBOARD SHAFT BOOT BAND:	**75**
INBOARD BOOT BAND:	**68**
OUTBOARD SHAFT BOOT BAND:	**75**
OUTBOARD BOOT BAND:	**70**

After '19:

INBOARD SHAFT BOOT BAND:	**23.75**
INBOARD BOOT BAND:	**64**
OUTBOARD SHAFT BOOT BAND:	**0255**
OUTBOARD BOOT BAND:	**0710**



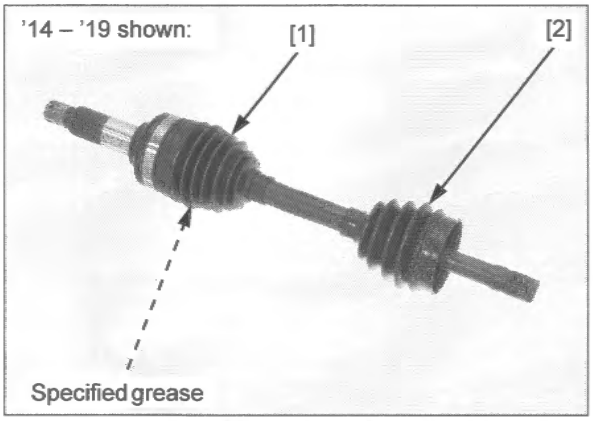
Pack the outboard joint with specified grease.

'14 – '19 FM and FE models/'15 – '16 FA models:

Specified grease: NKG814 (Kyodo Yushi)
Volume: 35 – 55 g (1.2 – 1.9 oz)

After '16 FA models/After '19 FM and FE models:

Specified grease: G.A. Besmoly CE (Brugarolas)
Volume: 50 – 70 g (1.8 – 2.5 oz)



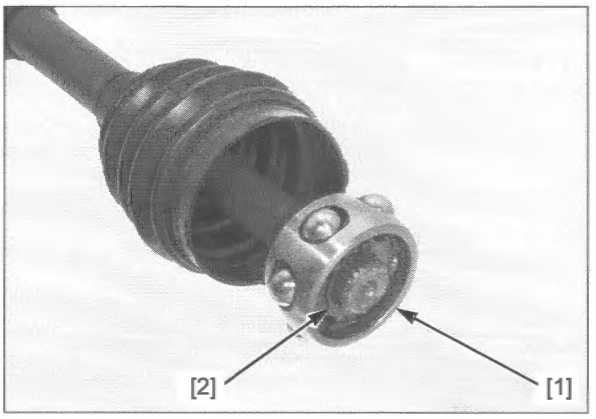
Install the following:

- outboard boot [1]
- inboard boot [2]

Do not tighten the bands at this time.

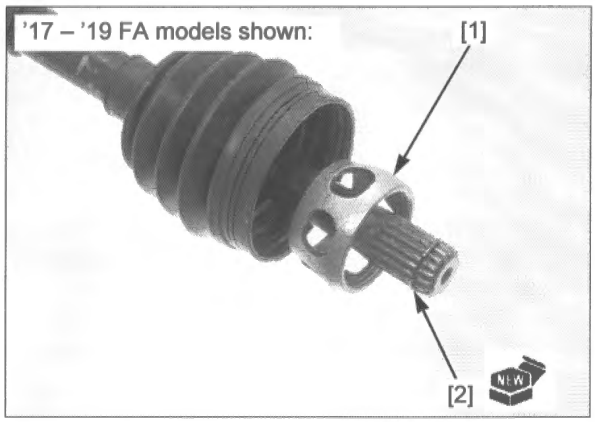
'14 – '19 FM and FE models/'15 – '16 FA models:

Install the bearing [1] with the small O.D. facing the drive shaft.
Install the snap ring [2] with the chamfered side facing the bearing.



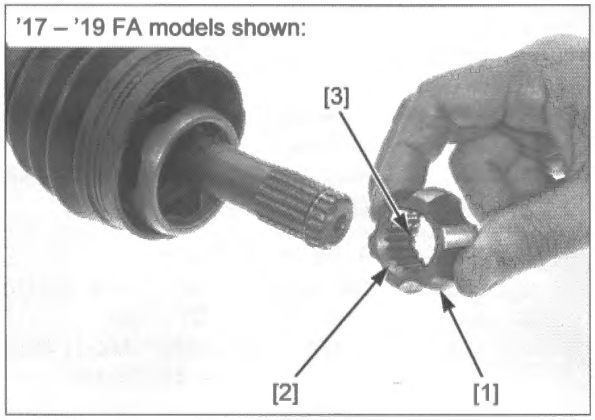
After '16 FA models/After '19 FM and FE models:

Install the bearing cage [1] with the small O.D. facing the drive shaft.
Install a new stopper ring [2] into the drive shaft groove.



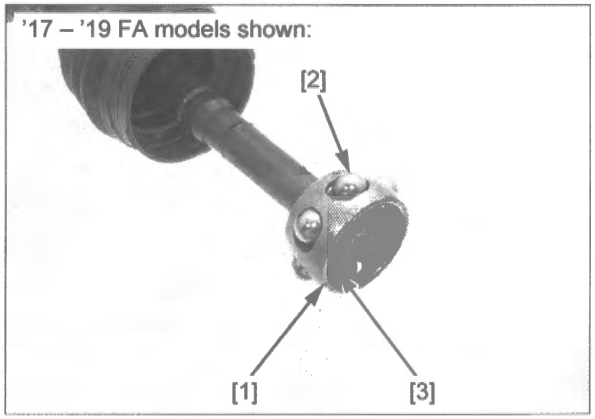
After '16 FA models/After '19 FM and FE models:

Install the inner race [1] with the chamfered I.D. [2] facing the drive shaft (ring groove [3] side facing opposite side).
Drive the shaft with a copper hammer until the stopper ring seats in the ring groove.



After '16 FA models/After '19 FM and FE models:

Assemble the bearing cage [1] and six balls [2] onto the inner race [3].



Pack the inboard joint with specified grease.

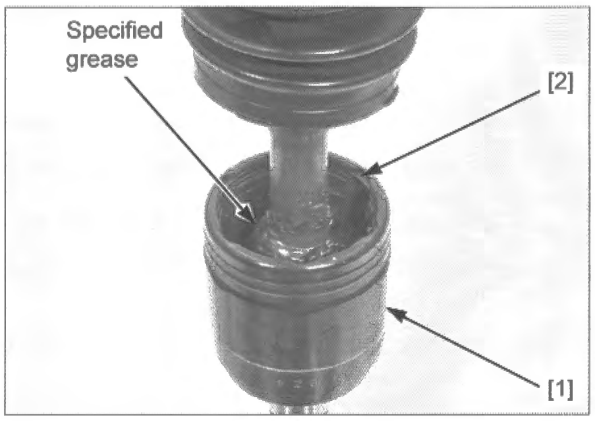
'14 – '19 FM and FE models/'15 – '16 FA models:

Specified grease: NKG814 (Kyodo Yushi)
Volume: 50 – 70 g (1.8 – 2.5 oz)

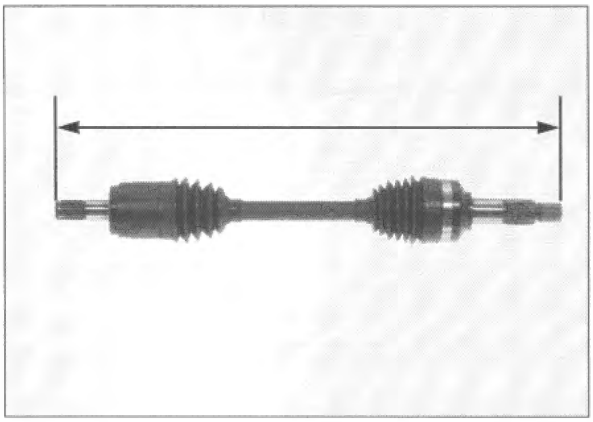
After '16 FA models/After '19 FM and FE models:

Specified grease: G.A. Besmoly CE (Brugarolas)
Volume: 65 – 85 g (2.3 – 3.0 oz)

Install the inboard joint [1] over the bearing.
Install the stopper ring [2] into the groove in the inboard joint properly.
Install the boot over the inboard joint.

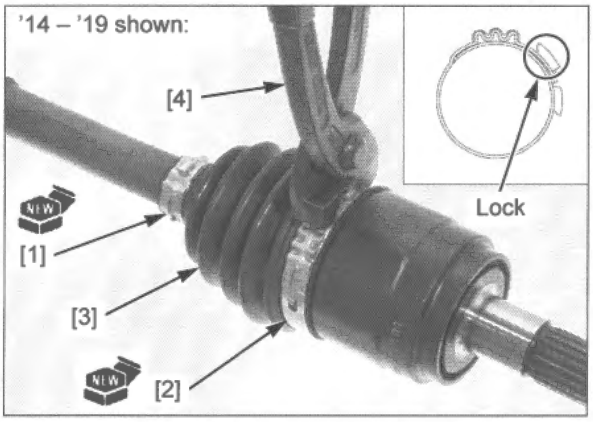


Adjust the length of the drive shaft to the figure given below.



DRIVE SHAFT LENGTH:
FM1/FM2/FE models
'14 – '19
Left: 509.9 mm (20.07 in)
Right: 523.6 mm (20.61 in)
FM5/FM6/FM7/FA models
'15 – '19
Left: 494.8 mm (19.48 in)
Right: 508.8 mm (20.03 in)
FM1/FM2/FM6/FE2/FA5/FA6/FA7 models
After '19
Left: 494.5 mm (19.47 in)
Right: 508.8 mm (20.03 in)

Install new shaft boot band [1] and inboard boot band [2] onto the inboard boot [3].

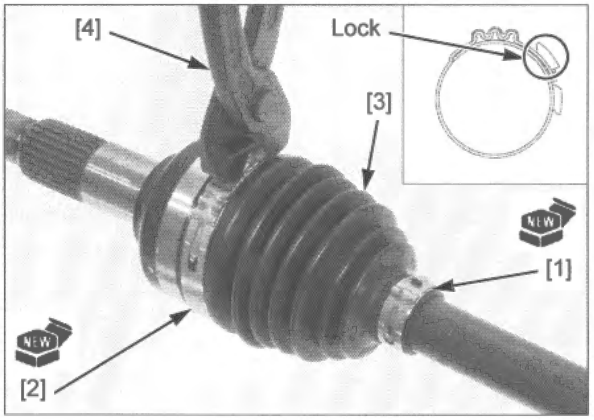


NOTE:
- Installation direction of the band (page 21-29).

Lock the boot bands using the following tool.

TOOL:
[4] CV Joint Band Pliers **OET 14100134 or equivalent**

'14 – '19: Install new shaft boot band [1] and outboard boot band [2] onto the outboard boot [3].

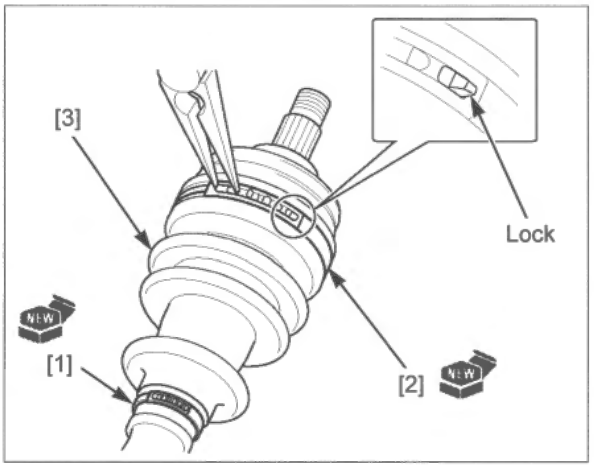


NOTE:
- Installation direction of the band (page 21-29).

Lock the boot bands using the following tool.

TOOL:
[4] CV Joint Band Pliers **OET 14100134 or equivalent**

After '19: Install new shaft boot band [1] and outboard boot band [2] onto the outboard boot [3].

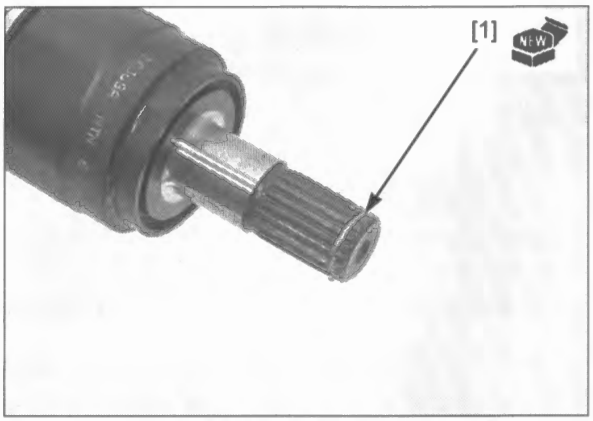


NOTE:
- Installation direction of the band (page 21-29).

Lock the boot bands.

INSTALLATION

Install a new stopper ring [1] into the groove in the inboard joint spline.

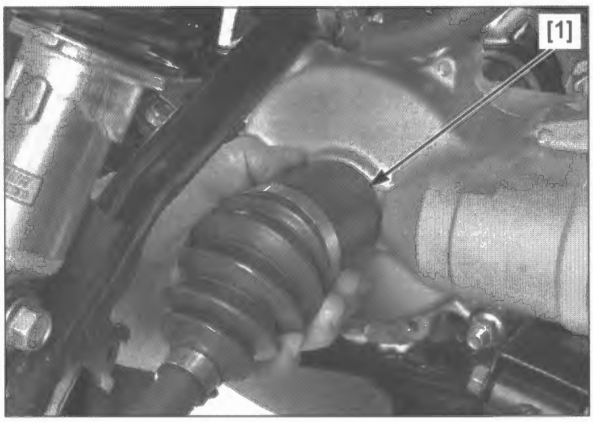


Be careful not to damage the oil seal in the gear case.

Install the drive shaft by holding the inboard joint [1] until the stopper ring seats in the groove of the differential.

Make sure that the stopper ring is seated properly by pulling on the inboard joint lightly.

Install the knuckle (page 18-19).



FRONT FINAL DRIVE REMOVAL

Remove the following:

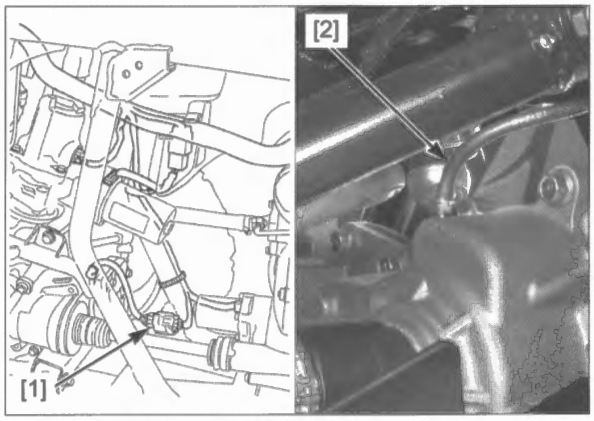
- tank cover assembly (page 2-4)
- left drive shaft (page 21-25)

FA models only: Remove the front VS sensor (page 13-66).

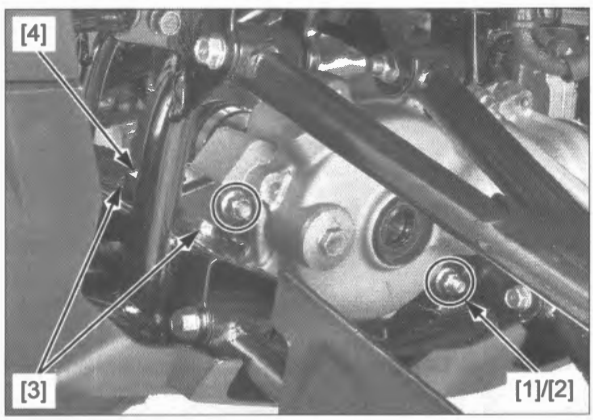
Drain the differential oil (page 3-21).

Remove the difflock actuator 10 P (Gray) connector [1] and disconnect it.

Disconnect the front final drive breather hose [2].



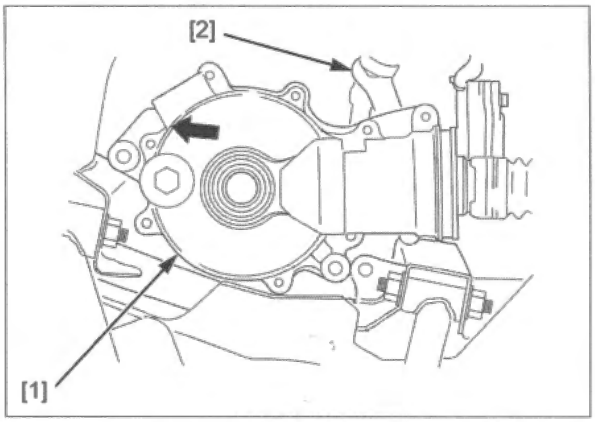
- final gear case mounting nuts [1] and bolts [2]
- bolts [3] and mounting bracket [4]



Move the gear case assembly [1] forward for maximum clearance between the propeller shaft joint and engine.

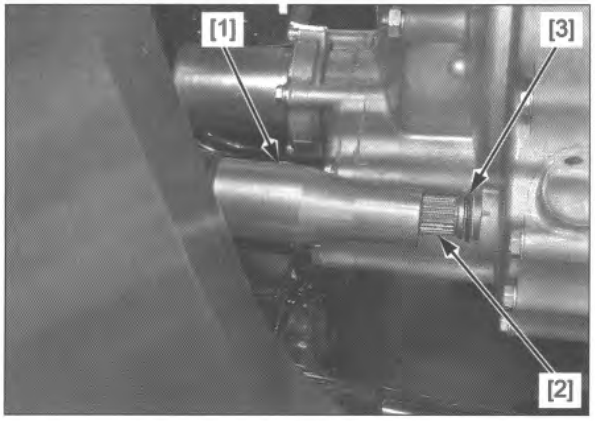
NOTE:

- Turn the handlebar all the way to the right to move the gear case assembly.
- Put some cloth on the gear case to avoid scratch or damage the tie-rod end [2].



Pull the propeller shaft joint [1] out of the output shaft [2] of the engine.

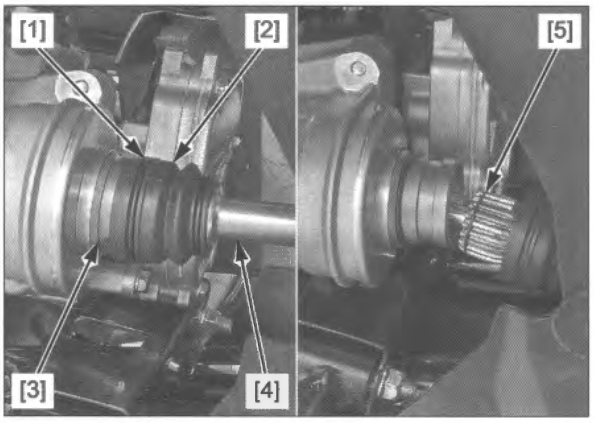
Remove the O-ring [3] from the output shaft.



Remove the boot band [1] and release the propeller shaft boot [2] off the final clutch joint [3] of the gear case assembly.

Pull the propeller shaft [4] to force the stopper ring [5] past the groove in the final clutch joint to remove the propeller shaft.

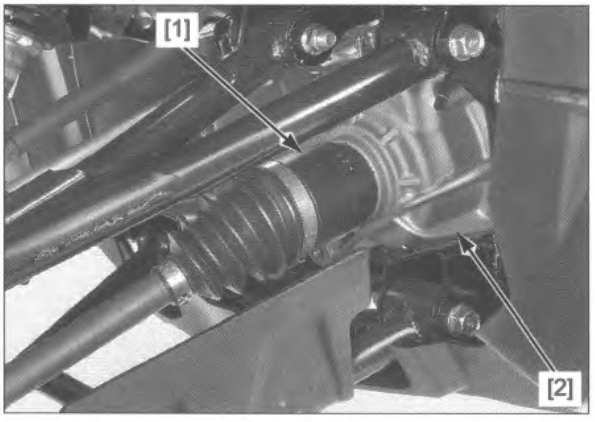
Remove the stopper ring from the propeller shaft.



Loosen the left lower arm pivot nuts and lower the lower arm.

Separate the right drive shaft [1] from the final gear case assembly [2] by tapping the right drive shaft end lightly through the gear case, using a screwdriver or equivalent.

Remove the gear case assembly from the frame.

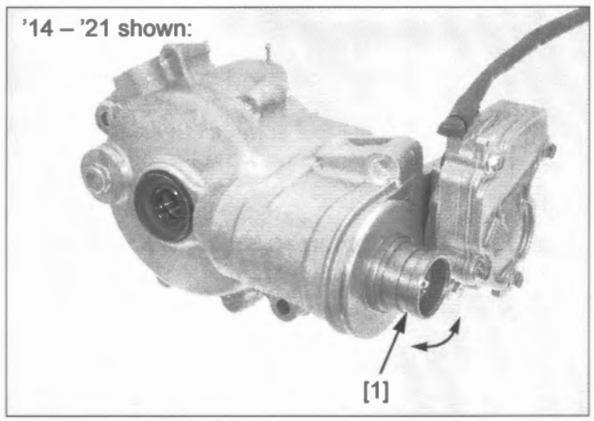


OPERATION CHECK

Temporarily connect the difflock actuator 10 P (Gray) connector and shift the drive mode to 4WD while turning the final clutch joint [1].
Turn the final clutch joint and check that the gear turns smoothly and quietly without binding.

If the gear does not turn smoothly or quietly, the pinion gear, ring gear, bearing and/or clutch components may be damaged or faulty. They must be checked after disassembly; replace them if necessary.

Operate the change-over mechanism while turning the final clutch joint, check for smooth engagement/ disengagement.

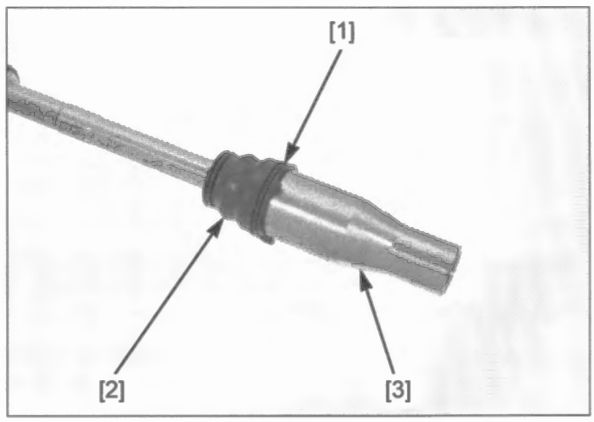


FRONT PROPELLER SHAFT

FM1/FM2/FE1/FE2:

DISASSEMBLY/INSPECTION

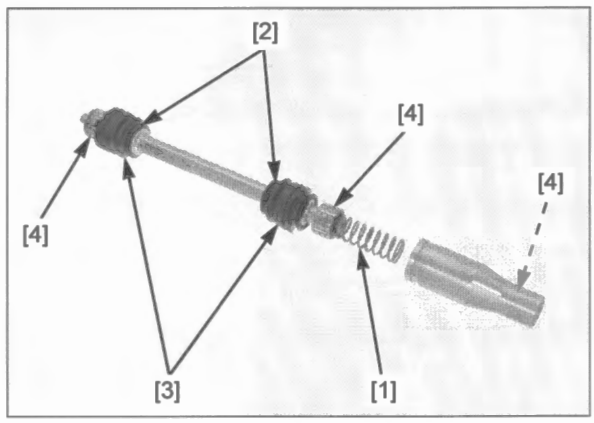
Remove the outer boot band [1] and shaft boot [2] from the propeller shaft joint [3], then remove the shaft joint.



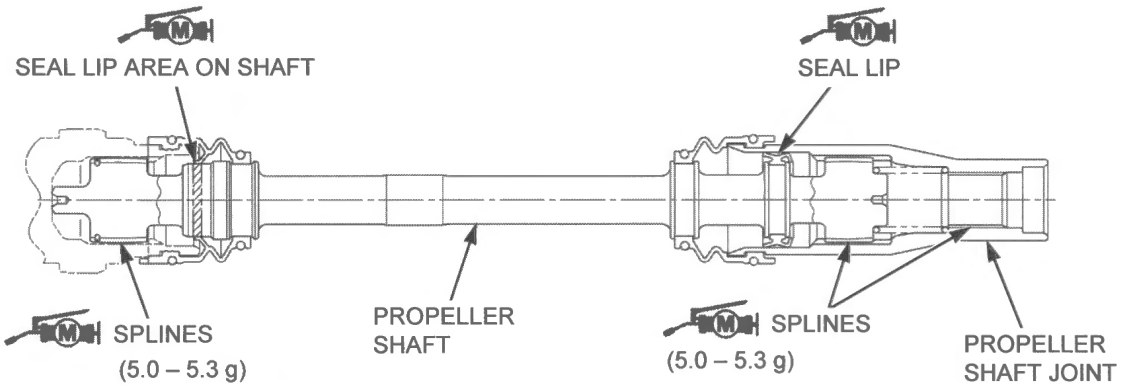
Remove the following:

- joint spring [1]
- inner boot bands [2]
- shaft boots [3]

Check the splines [4] of the propeller shaft and joint for wear or damage.
If they are damaged, check the splines of the output shaft and final clutch joint.
Check the boots for cuts, deterioration or damage.
Check the seal lip in each boots for damage.



ASSEMBLY

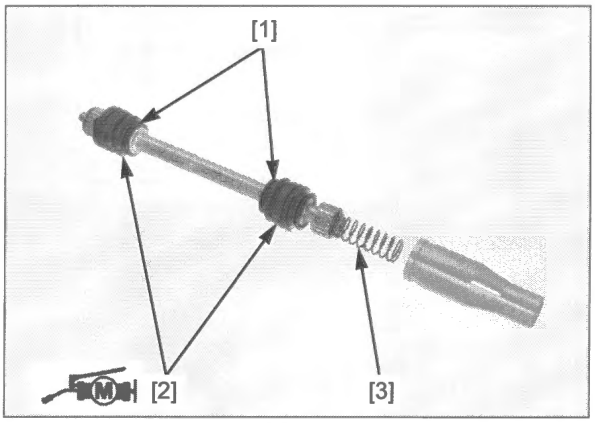


Place the inner boot bands [1] on the propeller shaft.

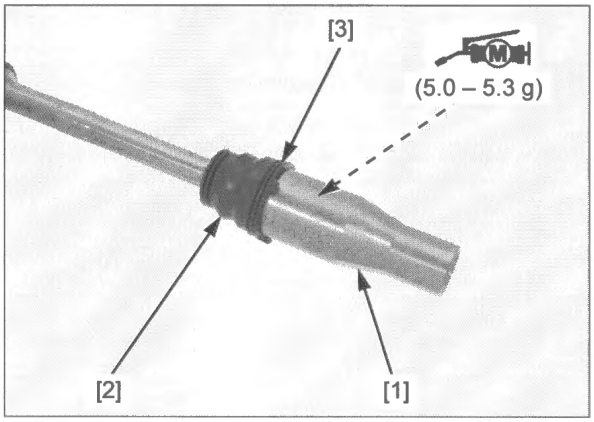
Do not allow the seal lip to turn inside out.

Apply molybdenum disulfide grease to the seal lips of each boot.
Install the boots [2] onto the shaft grooves, being careful not to damage the seal lip.
Install the boot bands into each boot groove.

Install the joint spring [3] into the propeller shaft securely.



Apply 5.0 – 5.3 g (0.18 – 0.19) of molybdenum disulfide grease to the propeller shaft joint splines.
Set the propeller shaft joint [1] onto the propeller shaft while compressing the spring, then install the boot [2] over the propeller shaft joint groove and the outer boot band [3] into the boot groove to secure it.



FM5/FM6/FM7/FA5/FA6/FA7:

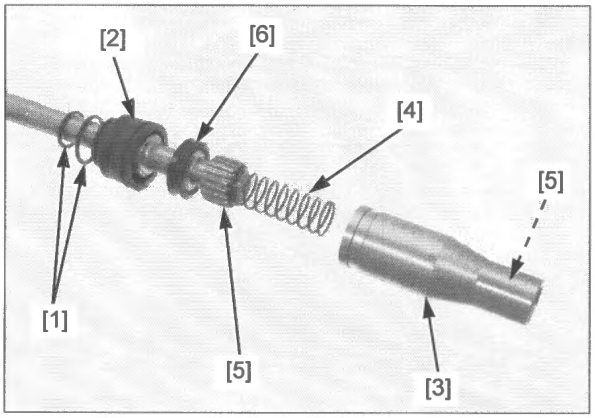
DISASSEMBLY/INSPECTION

Release the boot bands [1] and shaft boot [2] from the propeller shaft joint [3], then remove the shaft joint.

Remove the joint spring [4].

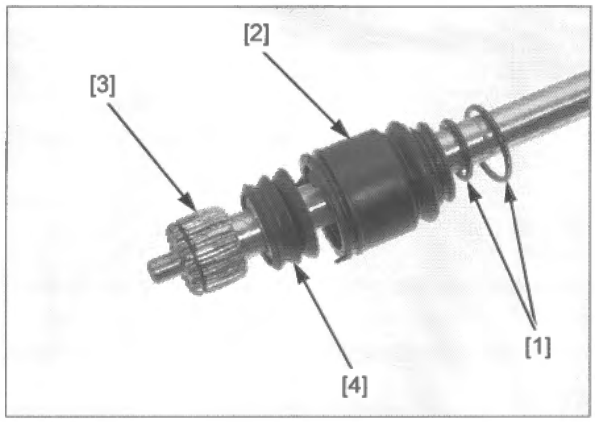
- joint spring [4]
- dust seal [5]

Check the splines [5] of the propeller shaft and joint for wear or damage.
If they are damaged, check the splines of the output shaft.
Check the boot for cuts, deterioration or damage.
Check the dust seal [6] lip for damage.

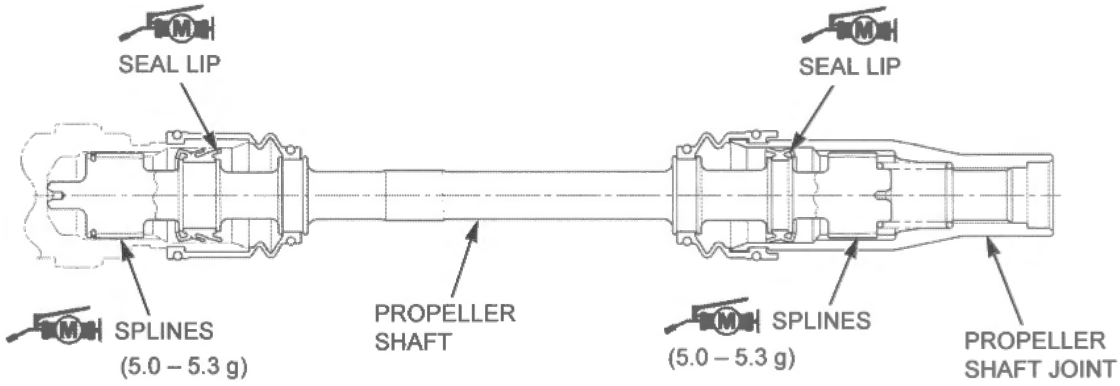


Release the boot bands [1] and shaft boot [2].

Check the splines [3] of the propeller shaft for wear or damage.
If they are damaged, check the splines of the final clutch joint.
Check the boot for cuts, deterioration or damage.
Check the dust seal [4] lip in for damage.



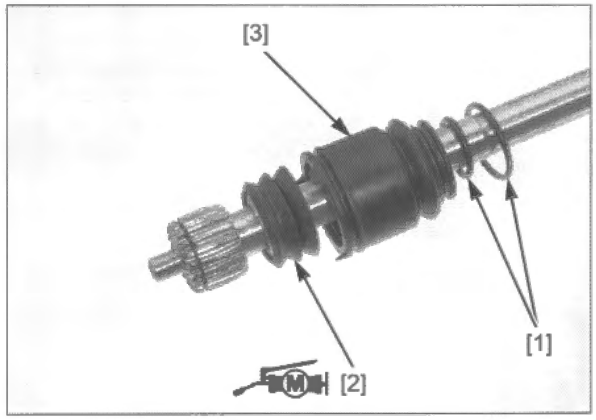
ASSEMBLY



Place the inner boot bands [1] on the propeller shaft.

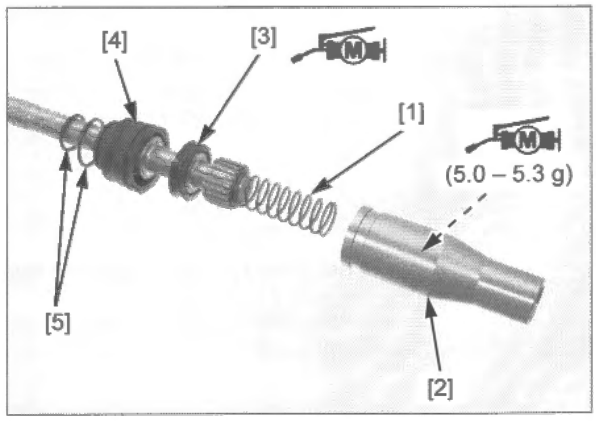
Apply molybdenum disulfide grease to the lips of the dust seal [2].

Install the boot [3] onto the shaft grooves.
Install the boot bands into each boot groove.



Install the joint spring [1] to the propeller shaft securely.

Apply 5.0 – 5.3 g (0.18 – 0.19) of molybdenum disulfide grease to the propeller shaft joint [2] splines and dust seal [3] lips.
Set the propeller shaft joint onto the propeller shaft while compressing the spring, then install the boot [4] over the propeller shaft joint groove and the boot bands [5] into the boot grooves to secure it.



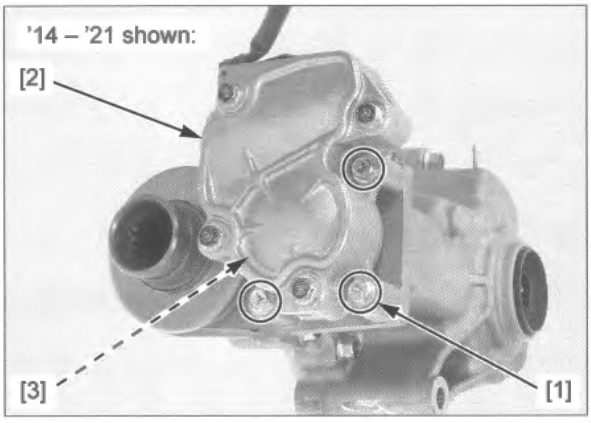
FRONT FINAL GEAR DISASSEMBLY/ INSPECTION

FRONT FINAL GEAR CASE SEPARATION

Remove the front final drive (page 21-32).

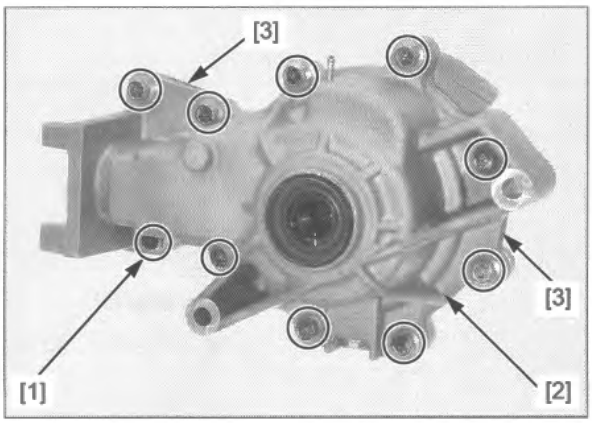
Remove the bolts [1] and difflock actuator [2].

Remove the O-ring [3] from the actuator.



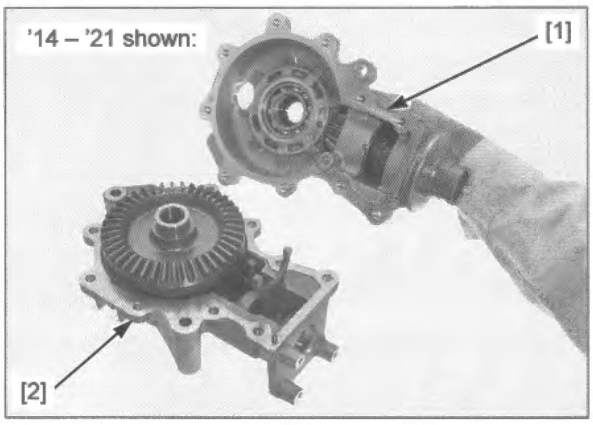
Loosen the cover bolts [1] in a crisscross pattern in several steps and remove them.

Pry the final gear case cover [2] at the points [3] as shown by using a screwdriver and remove it.



Place the front final gear case assembly with the gear case cover facing down.

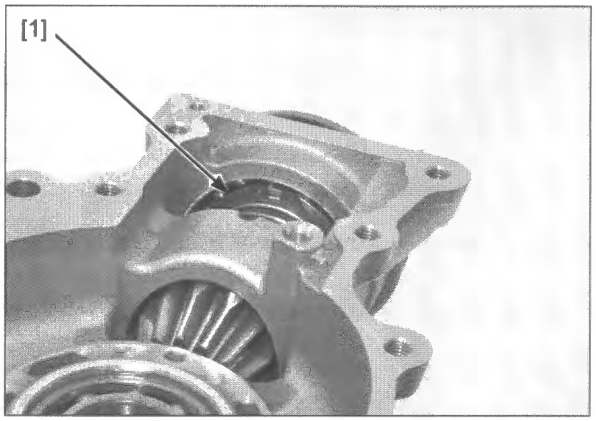
Separate the gear case [1] from the case cover [2].



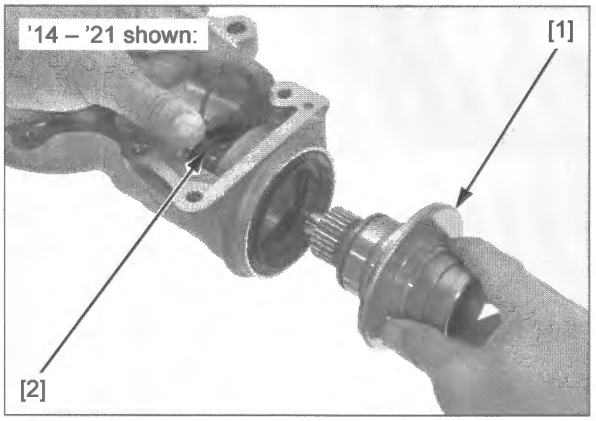
BACKLASH INSPECTION

Separate the front final gear case (page 21-37).

Remove the snap ring [1].

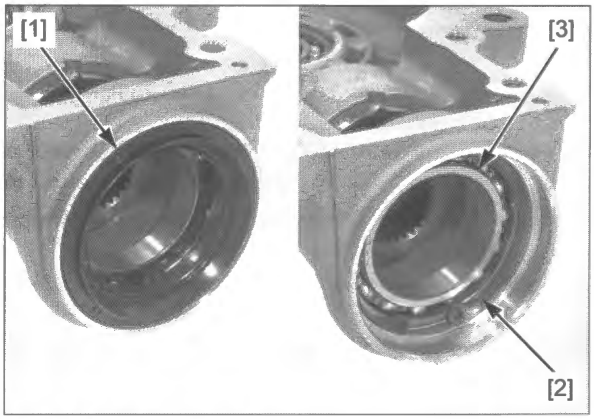


Remove the final clutch joint [1] and snap ring [2].

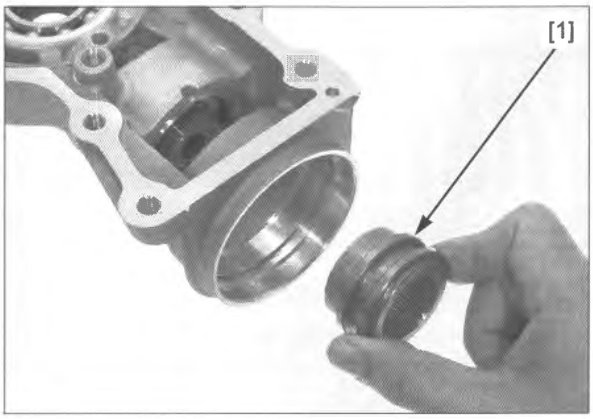


Remove the dust seal [1].

Remove the snap ring [2] and bearing [3].



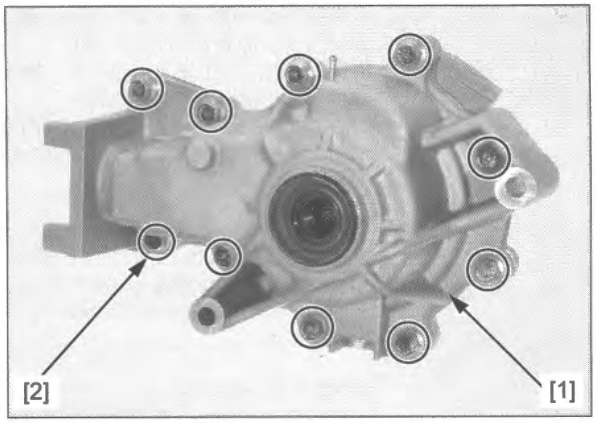
Remove the final clutch sleeve [1].



It is important to turn the pinion gear while tightening the bolts. If the ring gear shim is too thick, the gears will lock after only light tightening.

Install the case cover [1] and tighten the bolts [2] in several steps until the cover evenly touches the gear case.
Then, while rotating the pinion gear, tighten the bolts to the specified torque in a crisscross pattern in several steps.

TORQUE: 26 N·m (2.7 kgf·m, 19 lbf·ft)



Set the final gear case into a jig or vise with soft jaws.
Remove the oil filler cap.

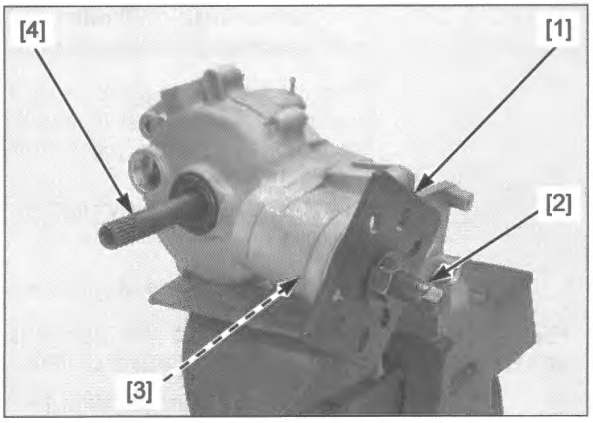
Hold the pinion gear with the special tools.

TOOLS:

[1] Pinion puller plate	**07HMC-MM80210**
[2] Threaded Shaft 12 x 1.25 x 80L	**07965-VM00200**
[3] Adapter Threaded	**070MF-HP50100**

U.S.A. TOOLS:

Pinion puller base	**07HMC-MM8011A**
Puller shaft	**07931-ME4010B**
Special nut	**07931-HB3020A**
Threaded adaptor	**070MF-HP5A100**



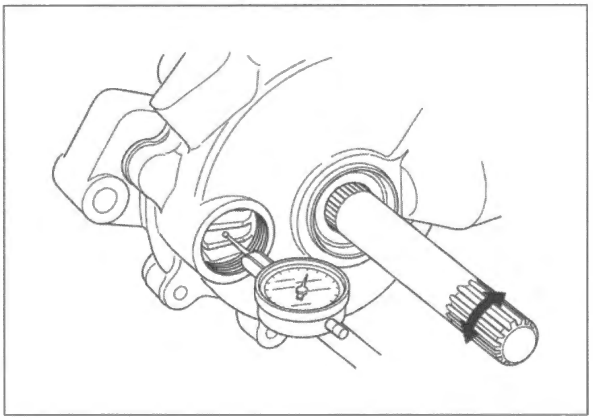
Install the differential inspection tool into the left side of the gear case.

TOOL:

[4] Torque Slip Inspection Attachment
07KMK-HC50101 or
07KMK-HC5010A
(U.S.A. only)

Set a dial indicator on the ring gear through the filler hole.
Turn the ring gear back and forth to read backlash.

STANDARD: 0.05 – 0.25 mm (0.002 – 0.010 in)
SERVICE LIMIT: 0.4 mm (0.02 in)

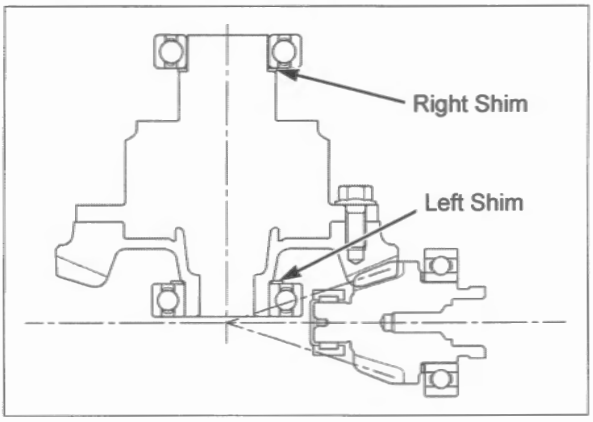


Remove the dial indicator. Turn the ring gear 120° and measure backlash. Repeat this procedure once more.
Compare the difference of the three measurements.

SERVICE LIMIT: 0.2 mm (0.01 in)

If the difference in measurements exceeds the service limit, it indicates that the bearing is not installed squarely, or the case is deformed.
Inspect the bearings and case.

If the backlash is excessive, replace the ring gear left side shim with a thinner one.
If the backlash is too small, replace the ring gear left side shim with a thicker one.
The backlash is changed by about 0.06 mm (0.002 in) when the thickness of the shim is changed by 0.10 mm (0.004 in).



NOTE:

- Eighteen different thickness shims are available from the thinnest (0.60 mm thickness: A) shim to the thickest (1.45 mm thickness: R) in intervals of 0.05 mm.

Ring gear shims:

A: (thinnest): 0.60 mm (0.024 in)
I: (standard): 1.00 mm (0.039 in)
R: (thickest): 1.45 mm (0.075 in)

Change the right side shim as follows: If the left shim was replaced with a 0.10 mm (0.004 in) **thicker** shim, replace the right shim with one that is 0.10 mm (0.004 in) **thinner**.

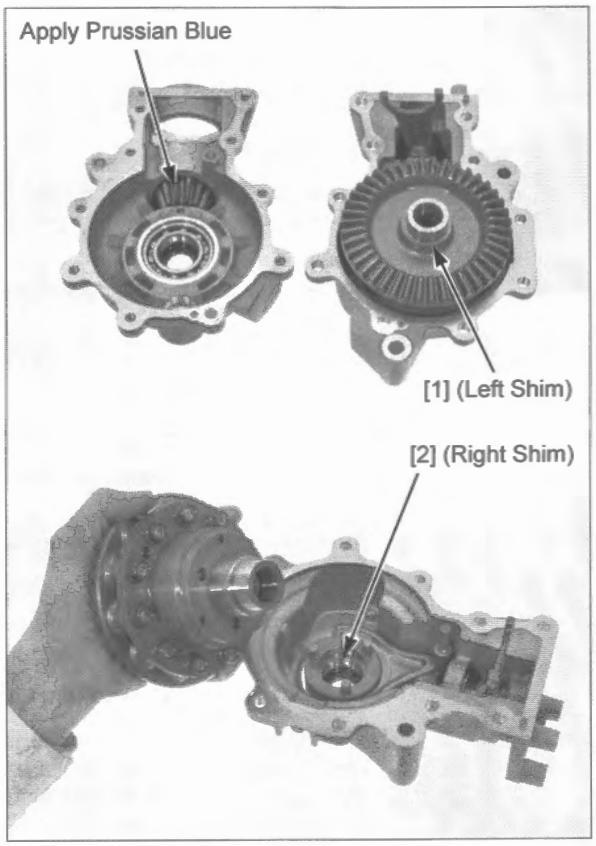
GEAR TOOTH CONTACT PATTERN CHECK

Separate the front final gear case (page 21-37).

Keep dust and dirt out of the case and cover.

Apply a thin coat of Prussian Blue to the pinion gear teeth for a tooth contact pattern check.

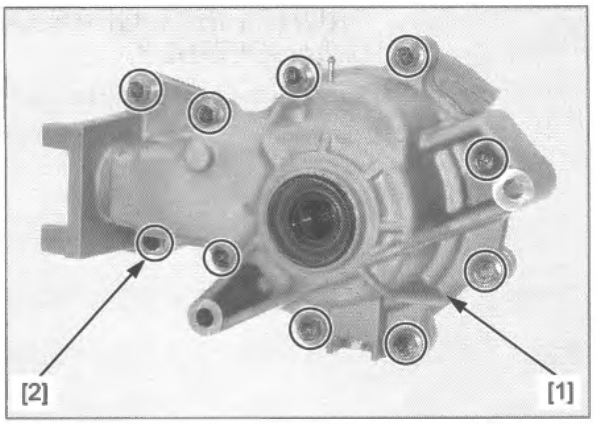
- Make sure the left shim [1] and right shim [2] are installed properly.



It is important to turn the pinion gear while tightening the bolts. If the ring gear shim is too thick, the gears will lock after only light tightening.

Install the case cover [1] and tighten the bolts [2] in several steps until the cover evenly touches the gear case.
Then, while rotating the pinion gear, tighten the bolts to the specified torque in a crisscross pattern in several steps.

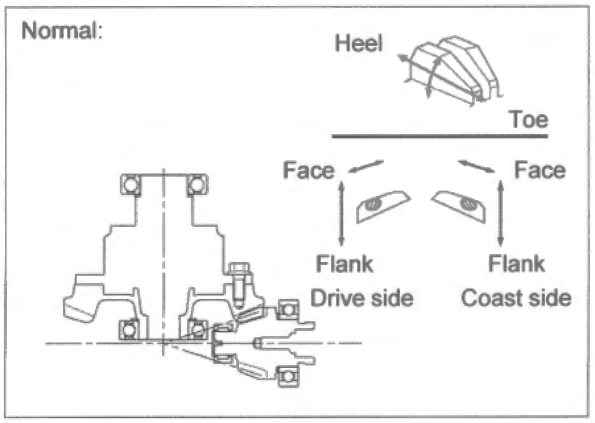
TORQUE: 26 N·m (2.7 kgf·m, 19 lbf·ft)



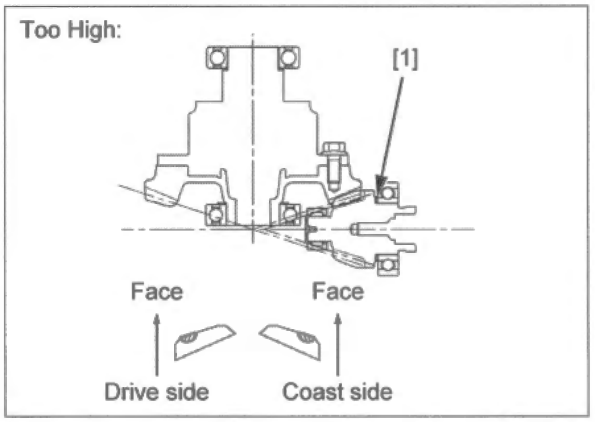
Rotate the ring gear several times in both directions of rotation.

Check the gear tooth contact pattern through the oil filler hole.
The pattern is indicated by the Prussian Blue applied to the pinion.
Contact is normal if the Prussian Blue is transferred to the approximate center of each tooth, but slightly to the heel side and to the flank side.

If the patterns are not correct, remove and change the pinion shim with one of an alternate thickness.



Replace the pinion shim [1] with a thicker one if the contact pattern is too high, toward the face.



Replace the pinion shim [1] with a thinner one if the contact pattern is too low, toward the flank.

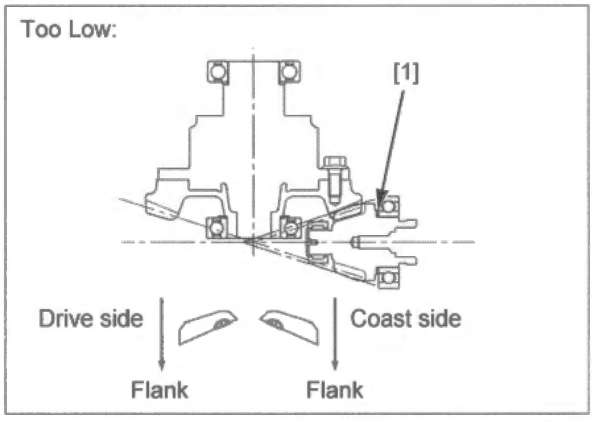
The pattern will shift about 0.5 – 1.0 mm (0.02 – 0.04 in) when the thickness of the shim is changed by 0.12 mm (0.005 in).

NOTE:

- Eighteen different thickness shims are available from the thinnest (0.60 mm thickness: A) shim to the thickest (1.45 mm thickness: R) in intervals of 0.05 mm.

Pinion shims:

A: (thinnest): 0.60 mm (0.024 in)
I: (standard): 1.00 mm (0.039 in)
R: (thickest): 1.45 mm (0.075 in)

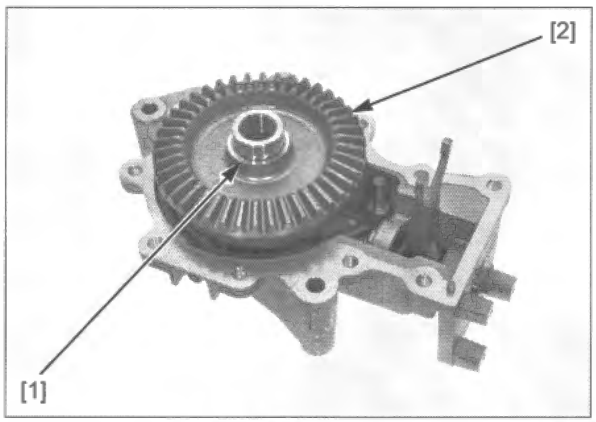


Pinion shim replacement (page 21-46).

FRONT FINAL GEAR COVER DISASSEMBLY

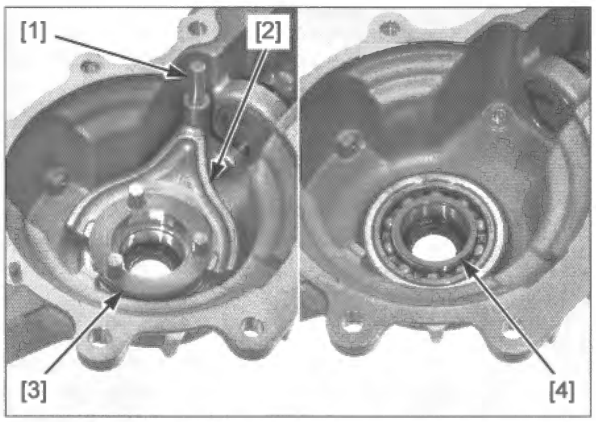
Separate the front final gear case (page 21-37).

Remove the shim [1] and differential assembly [2].

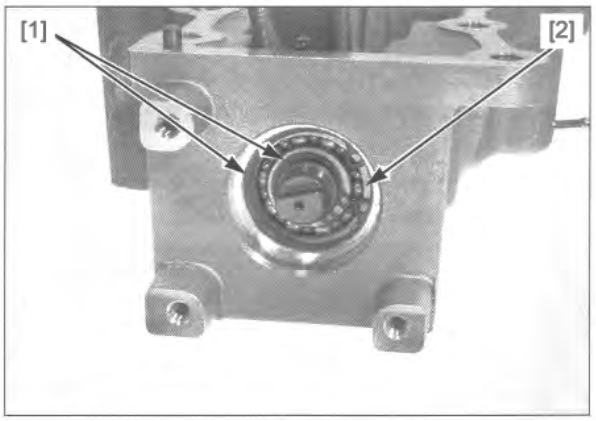


Remove the following:

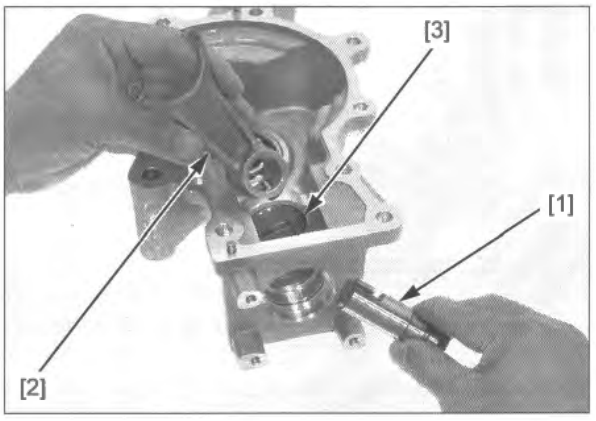
- difflock fork shaft [1]
- difflock fork [2]
- difflock sleeve [3]
- shim [4]



Remove the snap rings [1] and bearing [2].



Remove the screw shaft [1], final clutch fork [2] and difflock cam [3].



INSPECTION

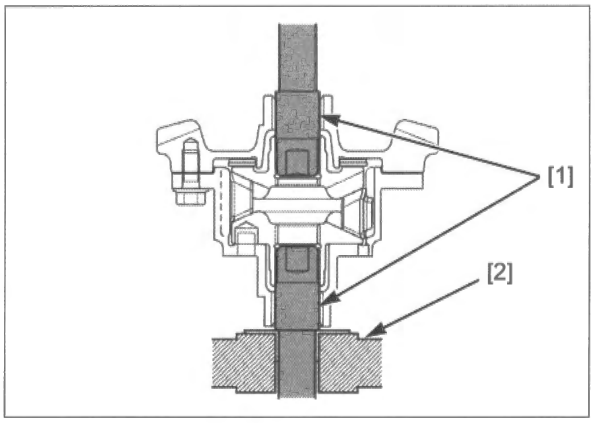
Inspect the following parts for scratches, damage, abnormal wear and deformation. Replace if necessary.

- final clutch joint
- final clutch sleeve
- difflock fork shaft
- difflock fork
- difflock sleeve
- screw shaft
- final clutch fork

DIFFERENTIAL

SLIP TORQUE INSPECTION

Install the inspection tools into both sides of the differential.



TOOL:

[1] Torque Slip Inspection Attachment (2 required)
07KMK-HC50101 or
07KMK-HC5010A
(U.S.A. only)

Hold the flat surface of the tool with a bench vise [2]. Attach a torque wrench to the other tool and measure the limited slip torque.

STANDARD:
14 – 17 N·m (1.45 – 1.75 kgf·m, 10 – 13 lbf·ft)
SERVICE LIMIT: 12 N·m (1.2 kgf·m, 9 lbf·ft)

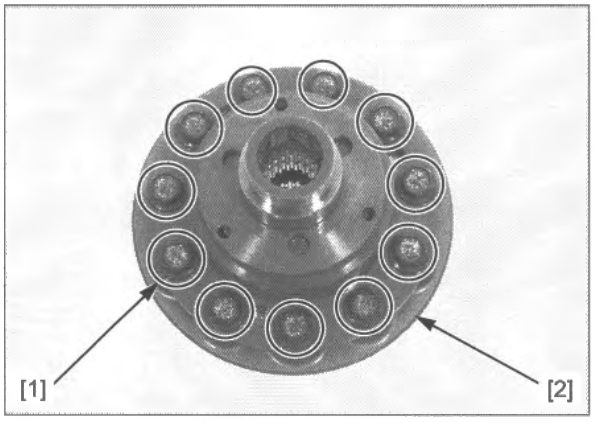
If the slip torque is out of specification, disassemble the differential and perform the components inspection (page 21-43) since the differential may be faulty.

DISASSEMBLY

NOTE:

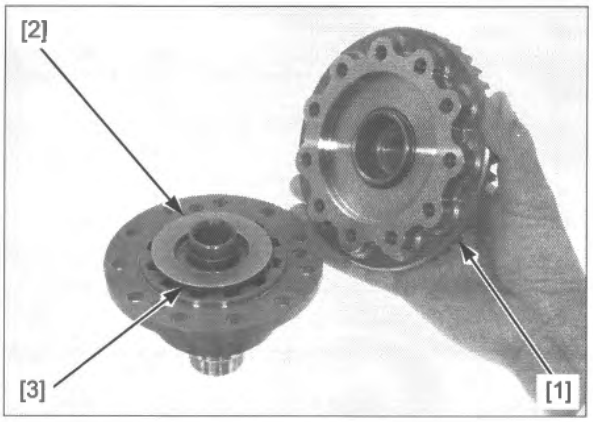
- When assembling the differential, both drive shafts are required to perform the face cam-to-housing alignment (page 21-53). The other drive shaft must be removed from the knuckle (page 18-14).

Remove the bolts [1], then place the differential assembly with the ring gear side [2] up.

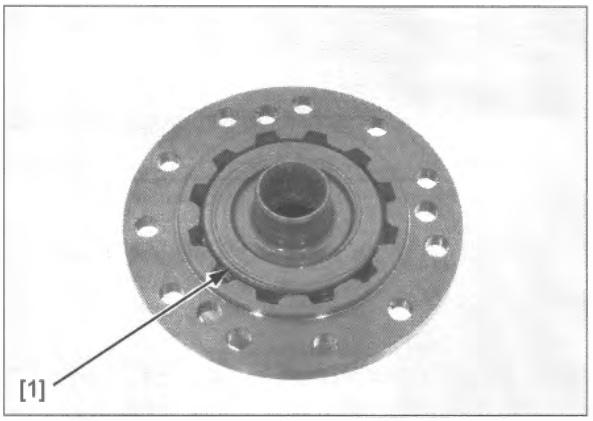


Remove the following:

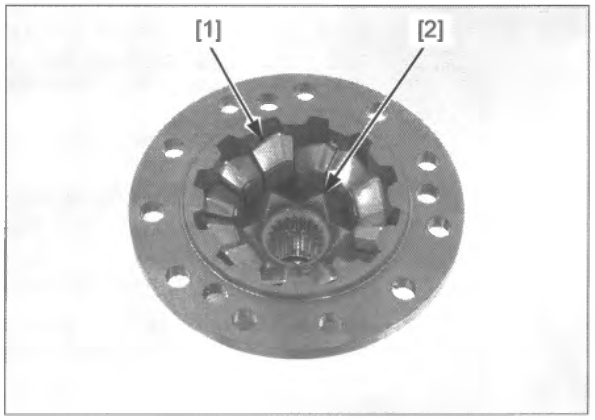
- ring gear [1]
- side cone spring [2]
- shim [3]



- face cam A [1]



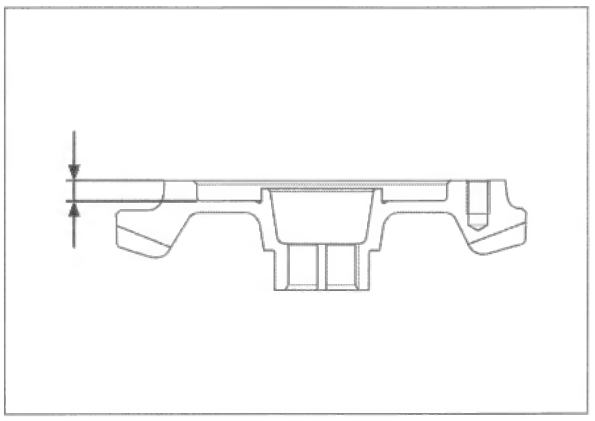
- six cam followers A and six cam followers B [1]
- face cam B [2]



RING GEAR INSPECTION

Check the sliding surface of the ring gear for damage or discoloration.
Measure the depth of the ring gear from the mating surface as shown.

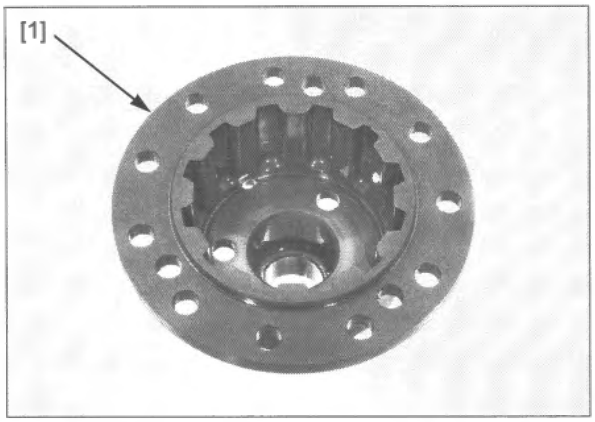
SERVICE LIMIT: 6.55 mm (0.258 in)



DIFFERENTIAL HOUSING/FACE CAM/CAM FOLLOWER INSPECTION

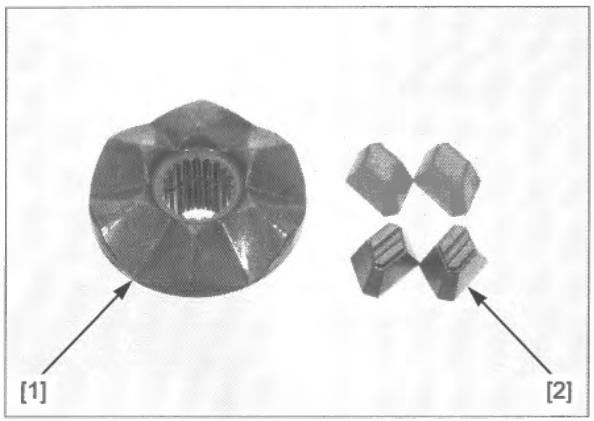
If the differential housing or face cam are faulty, replace the differential as an assembly.

Check the sliding surface and grooves of the housing [1] for damage or discoloration.



Replace the cam followers as a set (12 pieces).

Check the shim, face cams [1] and followers [2] for damage.

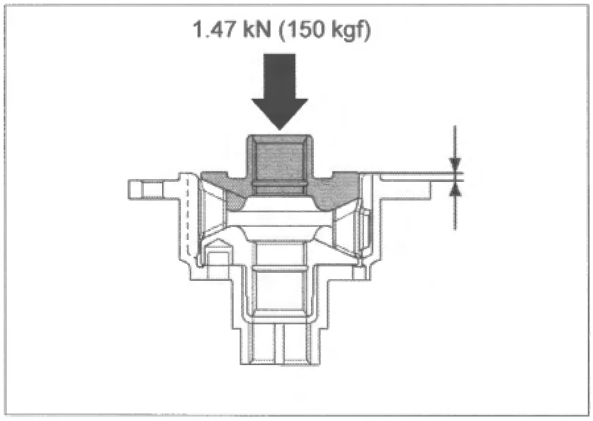


Temporarily assemble the differential housing, face cams and cam followers (page 21-53).

Measure the height of the face cam from the housing mating surface as shown while applying a load of 1.47 kN (150 kgf) to the face cam boss using a hydraulic press.

SERVICE LIMIT: 3.3 mm (0.13 in)

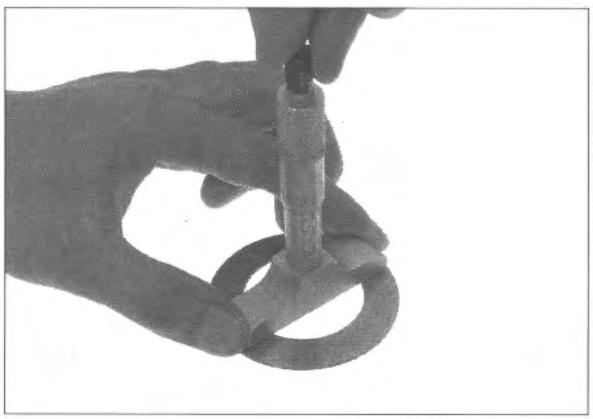
If the height is less than the limit, replace the differential as an assembly.



SIDE CONE SPRING INSPECTION

Check the cone spring for damage.
Measure the height of the spring.

SERVICE LIMIT: 2.6 mm (0.10 in)

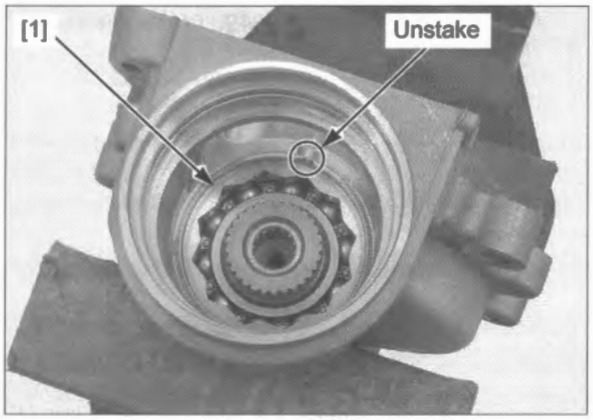


PINION GEAR

REMOVAL

Be careful that metal particles do not enter the bearing and the threads of the case are not damaged.

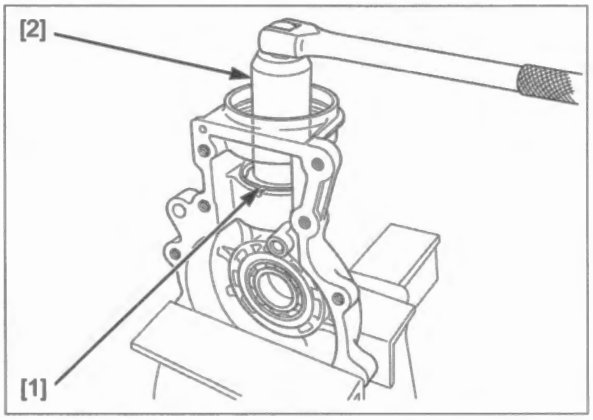
Unstake the bearing lock nut [1] with a drill or grinder.



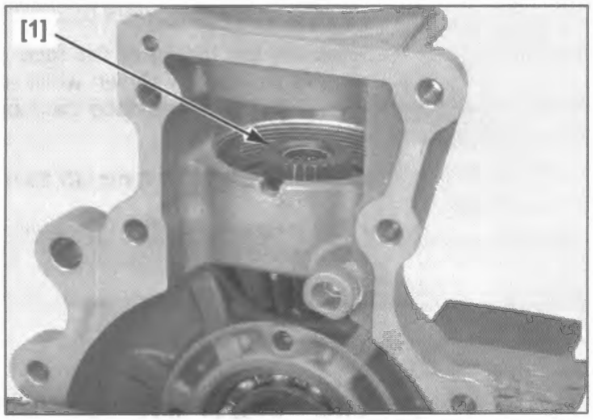
Remove the lock nut [1] using a special tool and discard it.

TOOL:

[2] Lock Nut Wrench, 44 mm	**070MA-HR40100 or 070MA-HR4A100 (U.S.A. only)**



Pull the pinion assembly [1] out from the gear case.



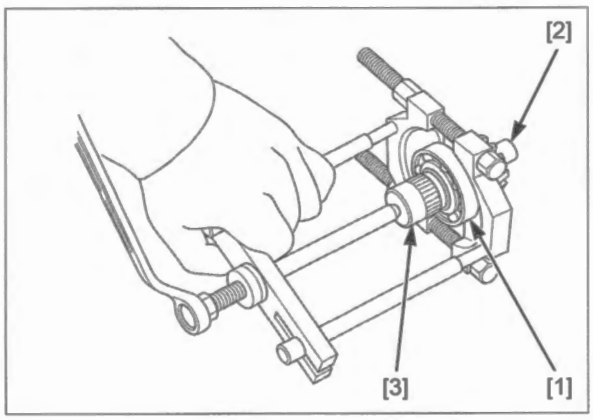
BALL BEARING AND SHIM REPLACEMENT

Protect the shaft end with the pilot or an equivalent [3].

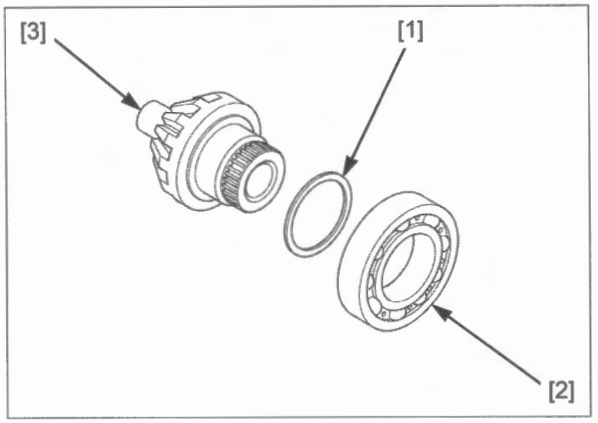
Pull the bearing [1] from the pinion gear [2] with a commercially available bearing puller.

Remove the bearing and pinion shim.

Replace the final clutch joint needle bearing in the shaft end if necessary (page 21-47).



Install the pinion shim [1] and bearing [2] onto the pinion gear [3].



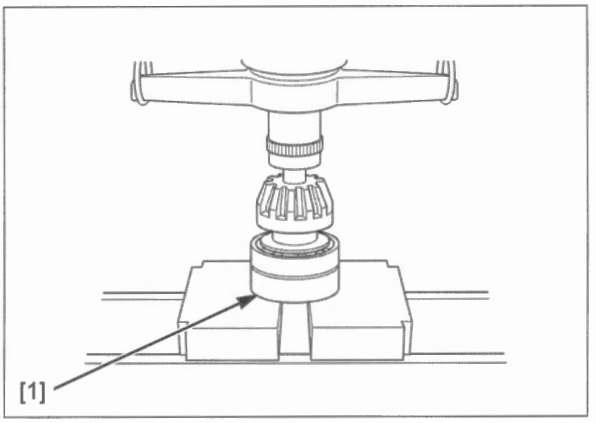
NOTE:

- When the gear set, differential bearing, differential housing and/or gear case has been replaced, use a 1.00 mm (0.039 in) thick shim for initial reference.

Press the pinion gear into a new bearing until it is fully seated by supporting the bearing inner race.

TOOL:

[1] Attachment, 35 mm I.D.	**07746-0030400**



FINAL CLUTCH JOINT NEEDLE BEARING REPLACEMENT

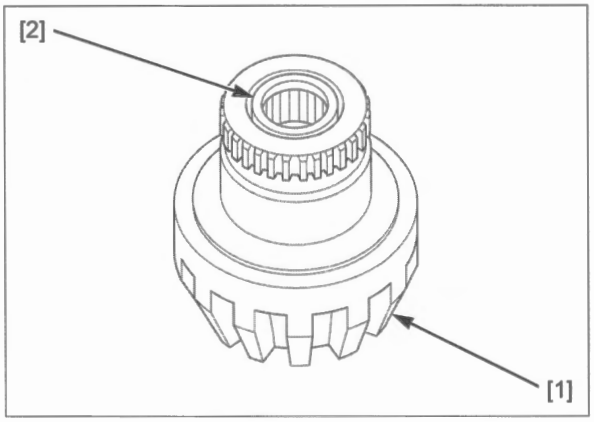
Remove the pinion ball bearing (page 21-46).

Be sure to wear heavy gloves to avoid burns when handling the heated gear. Using a torch to heat the gear may cause warpage.

Heat the pinion gear [1] to about 80°C (176°F) and remove the needle bearing [2], using the special tools.

TOOLS:

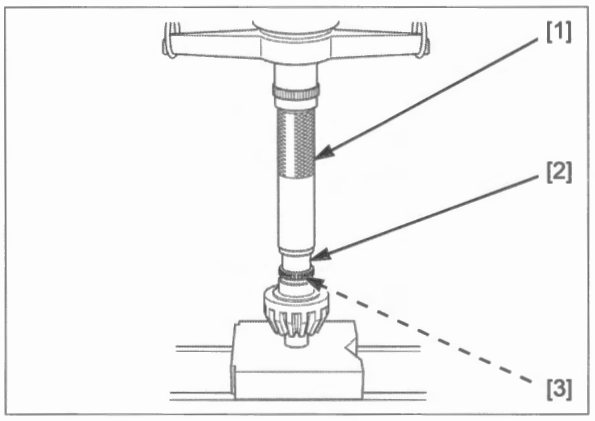
Remover head, 12 mm	**07936-1660110**
Remover shaft, 12 mm	**07936-1660120 or**
Bearing remover, 12 mm	**07936-166010A (U.S.A. only) with 07936-3710100**
Remover weight	**07741-0010201 or 07936-371020A (U.S.A. only)**



Press a new bearing into the pinion gear with the marking facing up so that it is flush with the shaft end.

TOOLS:

[1] Driver	**07749-0010000**
[2] Attachment, 22 x 24 mm	**07746-0010800 or 07746-001A800 (U.S.A. only)**
[3] Pilot, 12 mm	**07746-0040200**



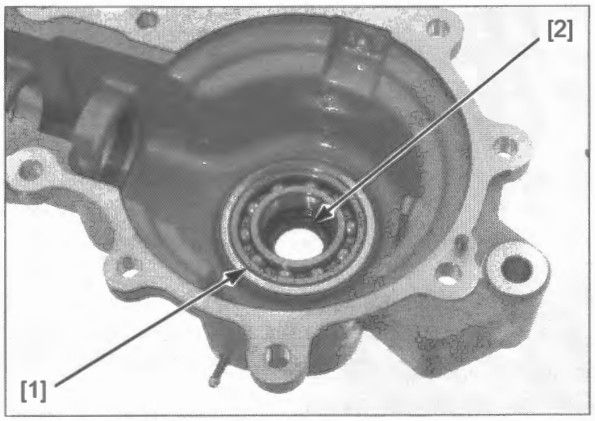
Install the pinion ball bearing (page 21-47).

GEAR CASE/COVER BEARING

DIFFERENTIAL BEARING INSPECTION/ REPLACEMENT

Turn the inner race of each bearing [1] in the gear case and case cover with your finger. The bearings should turn smoothly and quietly. Also check that the bearing outer race fits tightly in the case or cover.

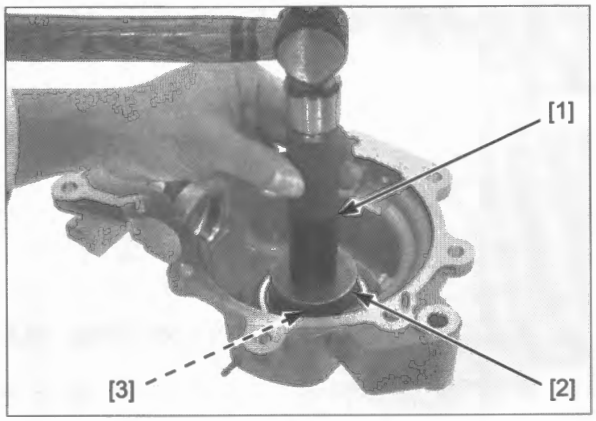
Remove the oil seals [2] from the gear case and cover. Drive the bearings out of the case and cover.



Drive the new bearings into the gear case and cover until it is fully seated.

TOOLS:

[1] Driver	**07749-0010000**
[2] Attachment, 52 x 55 mm	**07746-0010400**
[3] Pilot, 32 mm	**07MAD-PR90200**

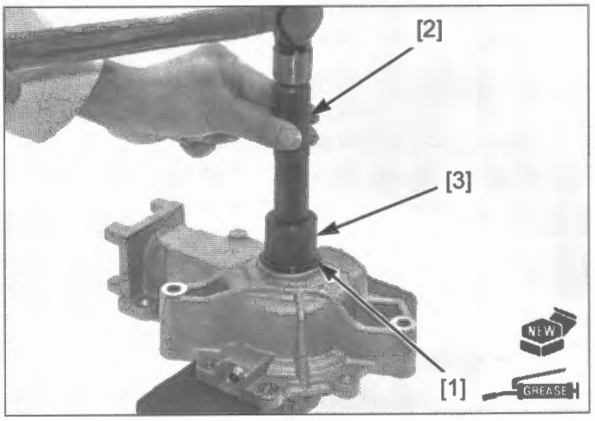


Apply grease to the seal lips of new oil seal [1].

Install each dust seal into the case and cover with the metal side facing out until it is fully seated.

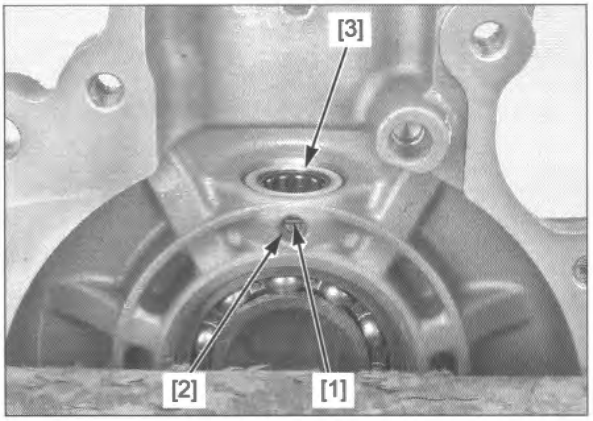
TOOLS:

[2] Driver	**07749-0010000**
[3] Attachment, 42 mm I.D.	**07QAD-P0A0100**



PINION NEEDLE BEARING

Rotate the stopper ring [1] until its end appears in the access hole [2].
Strike gently near the end of the ring with a punch to bend the end upward.
Grasp the end of the ring with needle-nose pliers and pull the stopper ring out through the access hole.



Remove the oil filler cap.

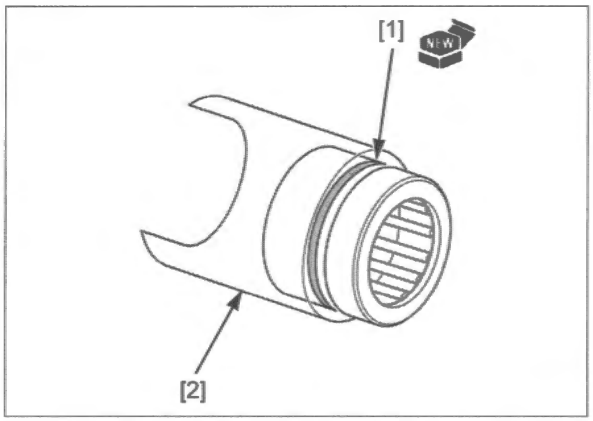
Be sure to wear heavy gloves to avoid burns when handling the heated gear case. Using a torch to heat the gear case may cause warpage.

Heat the gear case to about 80°C (176°F) and remove the needle bearing [3], using the special tools.

TOOLS:

Remover head, 15 mm	**07936-KC10200**
Remover shaft, 15 mm	**07936-KC10100**
Remover weight	**07741-0010201**
U.S.A. TOOLS:	
Bearing remover, 15 mm	**07936-KC10500**
Remover weight	**07936-371020A**

Install a new stopper ring [1] into the groove in a new bearing.



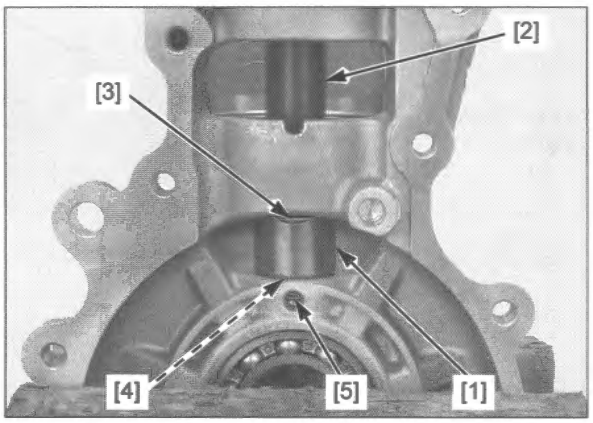
Make sure the stopper ring stays in the groove.

Install the bearing into the compressor [2] until the stopper ring is flush with the end of the tool.

TOOL:

Compressor Diff Bearing Clip 26 mm
070ME-HP50100 or
070ME-HP5A100
(U.S.A. only)

Place the driver, attachment and pilot on the top of the bearing and tape the driver to the compressor [1].



TOOLS:

[2] Driver	**07949-3710001**
[3] Attachment, 24 x 26 mm	**07746-0010700**
[4] Pilot, 15 mm	**07746-0040300**

Place the bearing and tool assembly into a freezer for at least 30 minutes.

Heat the gear case to 80°C (176°F).

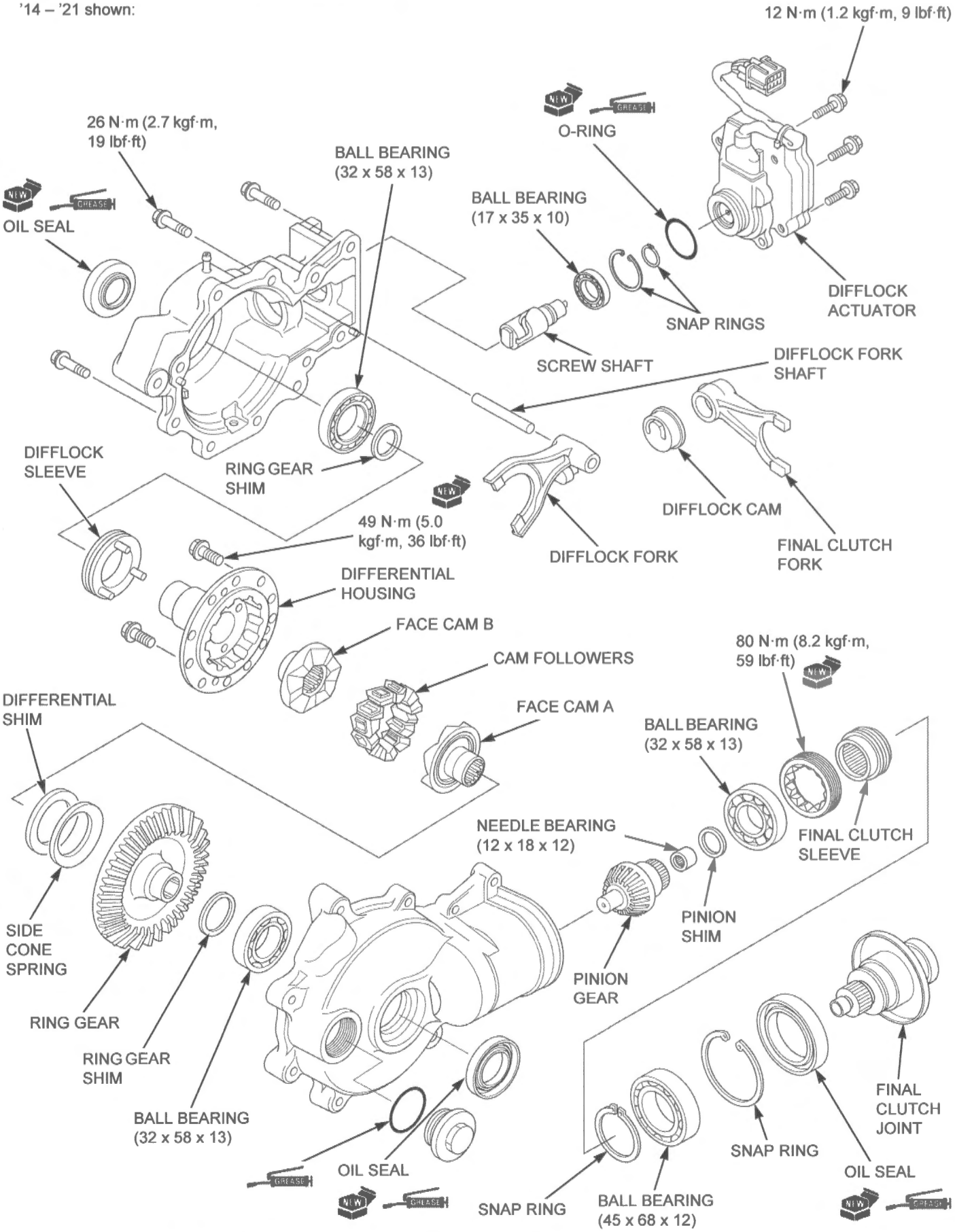
Remove the bearing and tool assembly from the freezer and drive the bearing into the gear case using the special tools.

Only strike the driver once. If you strike it more than once, the ring may slip out of the groove. If this happens, remove the ring and bearing, and install a new ring.

Make sure the stopper ring [5] is securely set in the groove of the gear case.

FRONT FINAL GEAR ASSEMBLY

'14 – '21 shown:

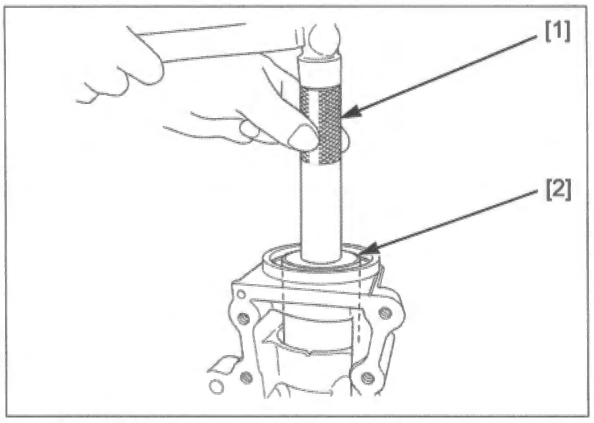


PINION GEAR INSTALLATION

Drive the pinion gear assembly into the gear case using the special tools.

TOOLS:

[1] Driver	**07749-0010000**
[2] Attachment	**07GAF-SD40200**

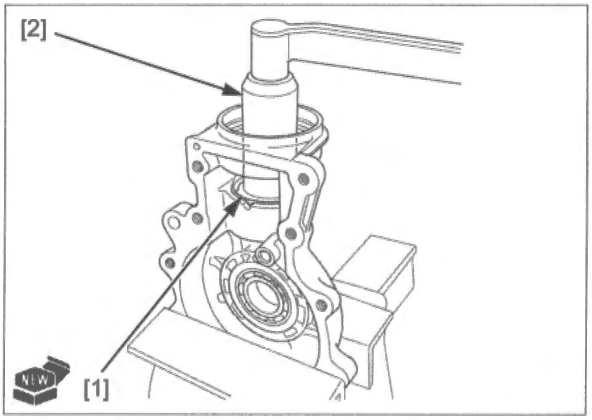


Install a new lock nut [1] and tighten it using a special tool.

TOOL:

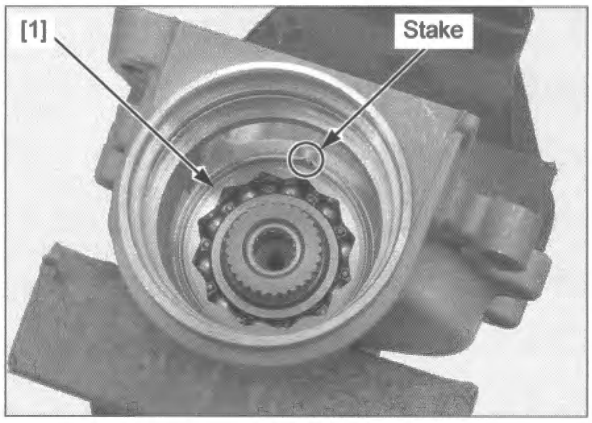
[2] Lock Nut Wrench, 44 mm	**070MA-HR40100 or 070MA-HR4A100 (U.S.A. only)**

TORQUE: 80 N·m (8.2 kgf·m, 59 lbf·ft)



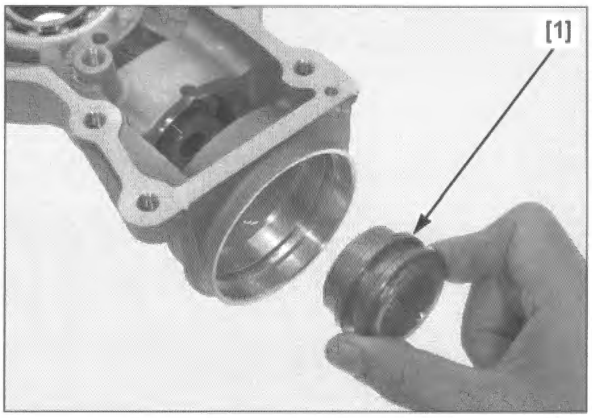
Be careful not to damage the threads of the case.

Stake the lock nut [1] into the case groove.

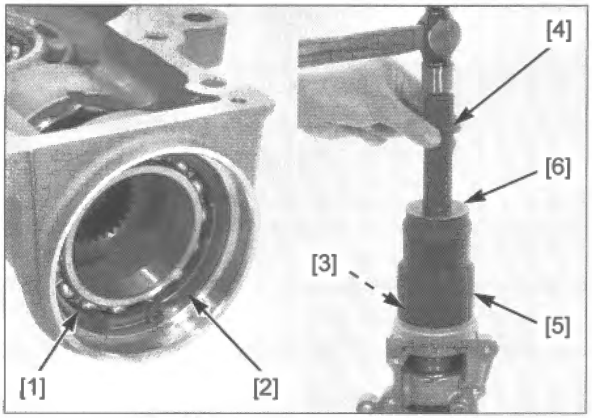


FRONT FINAL CLUTCH JOINT INSTALLATION

Install the final clutch sleeve [1].



Install the bearing [1].
Install the snap ring [2] into the cover groove securely with the chamfered edge facing the bearing.

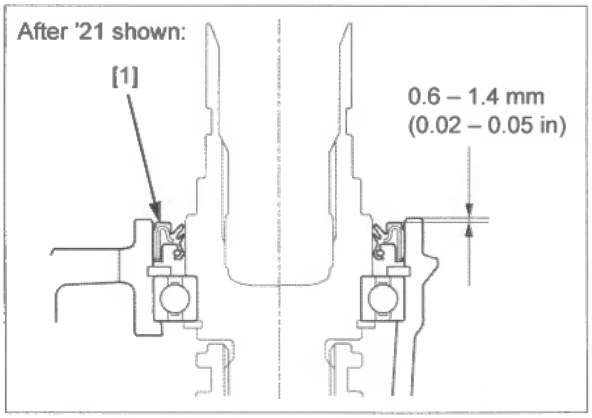


'14 – '21 models: Pack the seal lips of a new oil seal [3] with grease.
Install the oil seal until it is fully seated using the special tools.

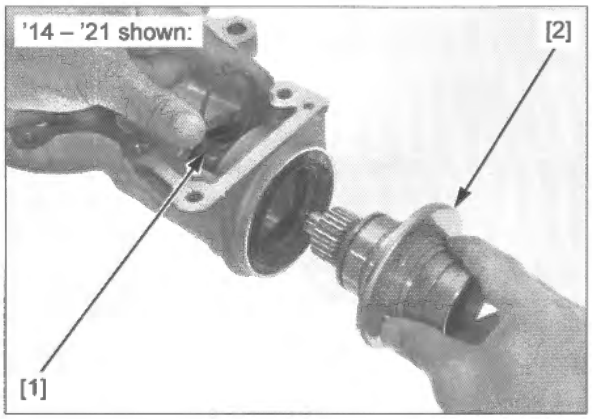
TOOLS:

[4] Driver	**07749-0010000**
[5] Base Assembly 56 x 66 mm	**070MF-MEC0300 (Not available In U.S.A.)**
[6] Attachment, 62 x 68 mm	**07746-0010500**

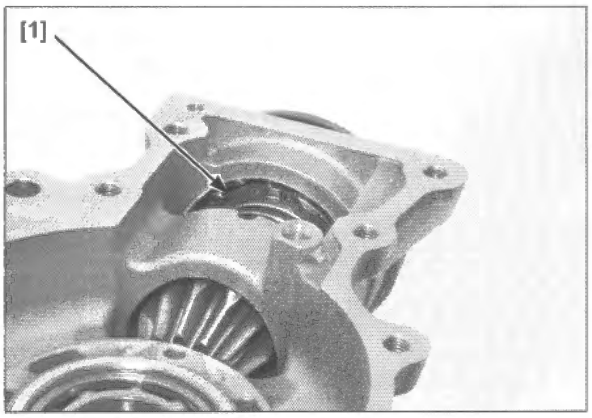
After' '21 models: Pack the seal lips of a new oil seal [1] with grease.
Install the oil seal to the specified depth from the top of gear case using the special tools above.



Install the snap ring [1] and final clutch joint [2].



Install the snap ring [1] into the final clutch joint groove securely with the chamfered edge facing the bearing.



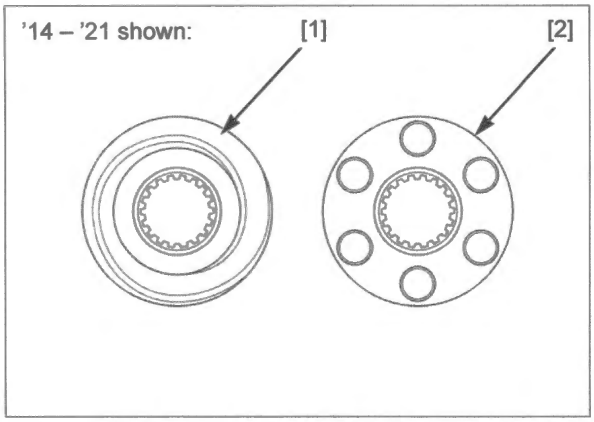
DIFFERENTIAL ASSEMBLY

Keep dust and dirt out of the differential housing.

Install the face cam B into the differential housing.

There are two face cams.

- face cam A [1] has six holes
- face cam B [2] has groove

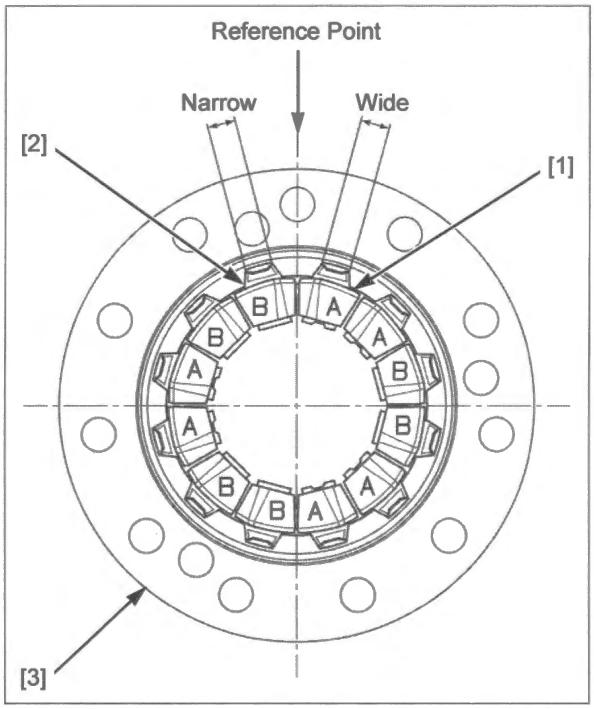


Install six cam followers A (rib) [1] and six followers B (flat) [2] into the specified grooves in the housing [3] by two and two as shown.

For easy installation, find the reference point that is lined up the bolt hole and housing lug in a straight line, and mark the housing using a marker. Start follower setting from the housing groove near by this point in successively.

NOTE:

- The housing grooves are sized differently to accommodate the differently sized A and B cam followers. Make sure to install the followers correctly.



Install the face cam A [1] onto the cam followers.

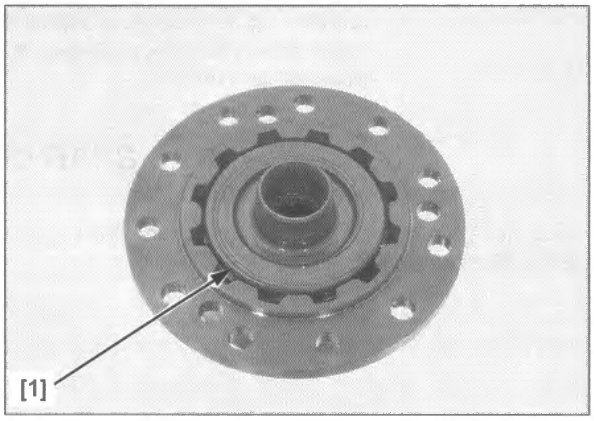
Measure the following dimensions and record them.

– depth of the ring gear (page 21-44)
– height of the housing-to-cam (page 21-45)

Calculate the shim thickness using the equation below. The correct shim is nearly this dimension.

A = B – C – 1.6 mm

A: New shim thickness
B: Recorded ring gear depth
C: Recorded cam height

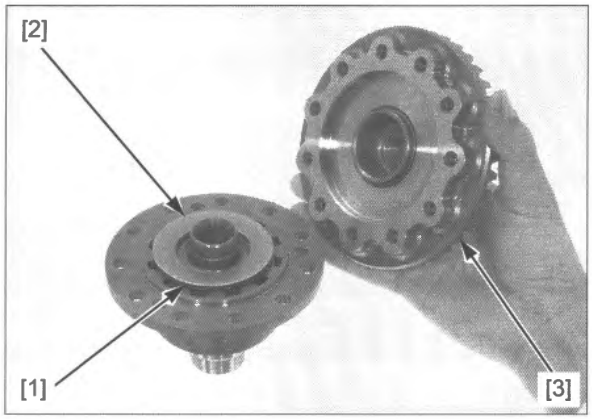


Select the shim [1] and install it onto the face cam.

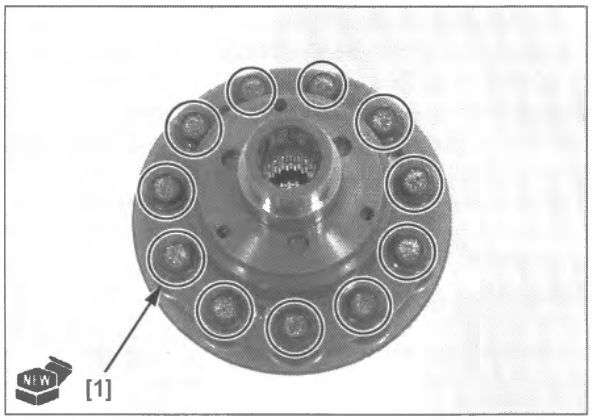
Differential shims:
A: 1.3 mm (0.051 in) **E: 1.7 mm (0.067 in)**
B: 1.4 mm (0.055 in) **F: 1.8 mm (0.071 in)**
C: 1.5 mm (0.059 in) **G: 1.9 mm (0.075 in)**
D: 1.6 mm (0.063 in) [standard]

Install the cone spring [2] with the concave side facing up (ring gear side).

Install the ring gear [3].



Install new ring gear bolts [1] and screw them until the seating surfaces of all the bolts touch the housing, but do not tighten them yet.



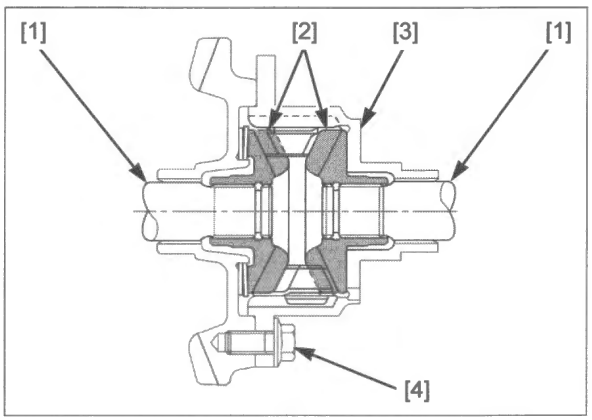
Temporarily install the drive shafts [1] into the differential assembly without the stopper rings until they are fully seated to align the face cams [2] with the differential housing [3].

Tighten the ring gear bolts [4] to the specified torque in a crisscross pattern in several steps.

TORQUE: 49 N·m (5.0 kgf·m, 36 lbf·ft)

Remove the drive shafts.

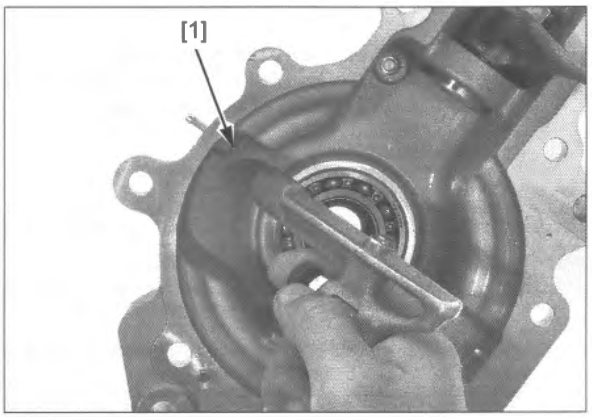
Inspect the slip torque (page 21-43).
If the slip torque is out of specification, perform the shim adjustment. Replace the differential assembly when the replacement shim is changed by 0.3 mm or more from the selected shim.



FRONT FINAL GEAR COVER ASSEMBLY

Keep dust and dirt out of the case and cover.

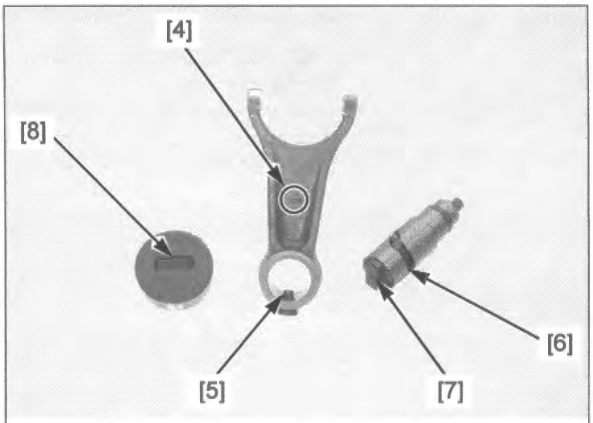
Blow compressed air through the breather hole [1] in the case cover.

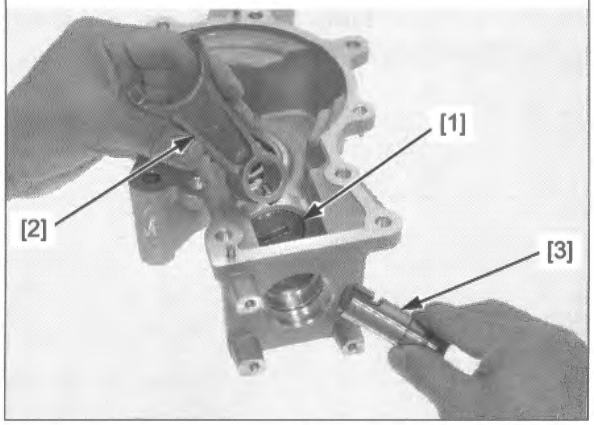


Install the following:

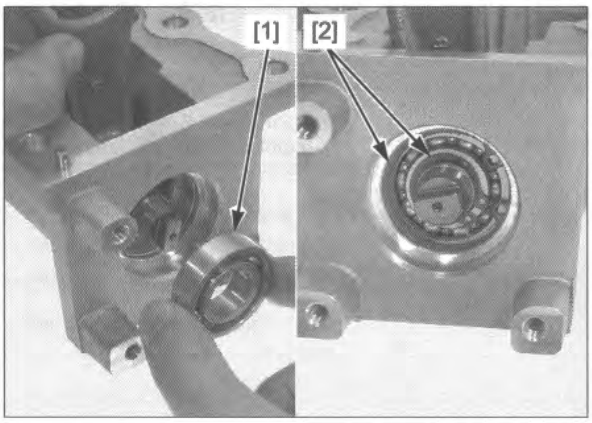
- difflock cam [1]
- final clutch fork [2]
- screw shaft [3]

- Install the final clutch fork with the "B" mark [4] facing the screw shaft.
- Align the following:
  - final clutch fork pin [5] with the screw shaft groove [6]
  - screw shaft boss [7] with the difflock cam groove [8]





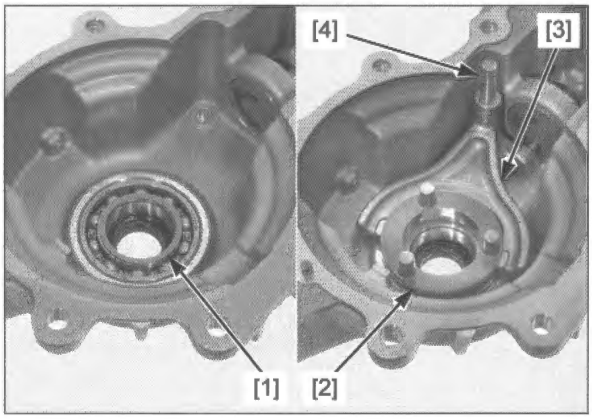
Install the bearing [1] and snap rings [2] with the chamfered edge facing the bearing.



Install the proper ring gear shim [1] onto the bearing.

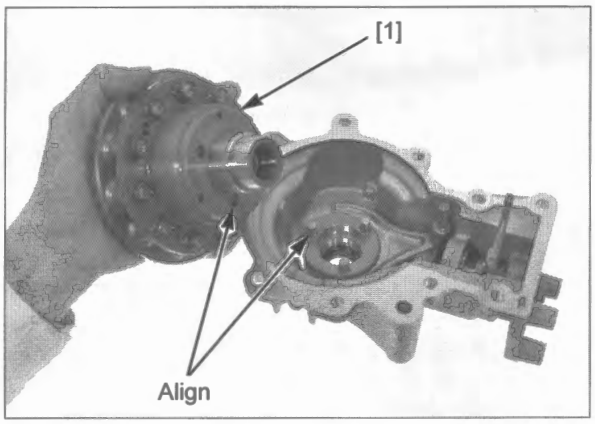
Install the following:

- difflock sleeve [2]
- difflock fork [3]
- difflock fork shaft [4]

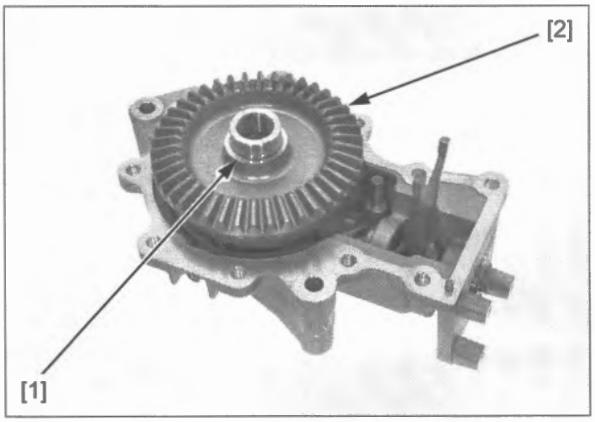


Install the differential assembly [1].

- Align the differential housing holes with the difflock sleeve bosses.
- Before installing the assembly, be sure to verify the alignment using the drive shafts (page 21-54).



Install the proper ring gear shim [1] onto the differential assembly [2].



FRONT FINAL GEAR ASSEMBLY

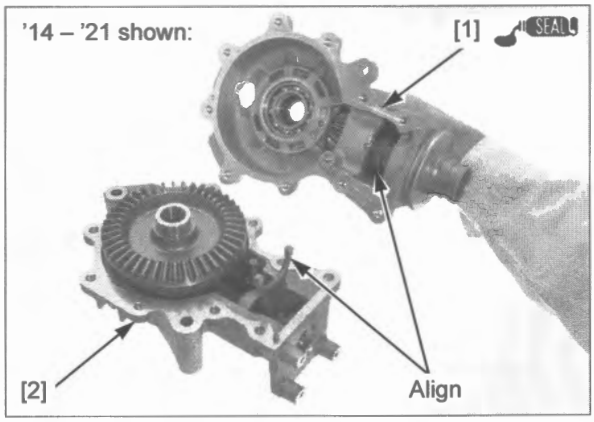
NOTE:

- When the gear set, bearing, differential housing and/or gear case has been replaced, check the following:
  - tooth contact pattern (page 21-40)
  - gear backlash (page 21-38)

Apply liquid sealant (TB1215 or equivalent) to the mating surface of the gear case [1].

Install the gear case onto the cover [2].

- Align the final clutch fork with the final clutch sleeve groove.



Install the bolts [1] and screw them until the cover evenly touches the case.

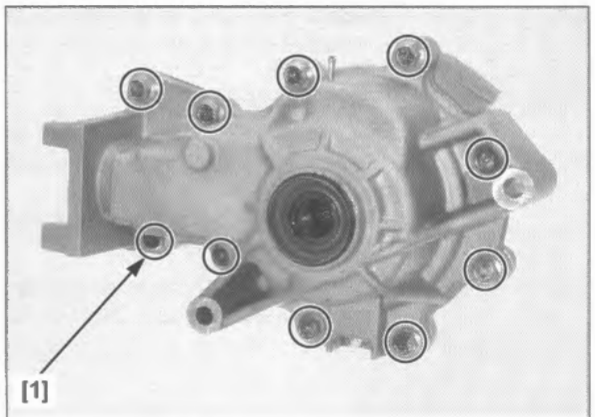
It is important to turn the pinion gear while tightening the bolts. If the ring gear shim is too thick, the gears will lock after only light tightening.

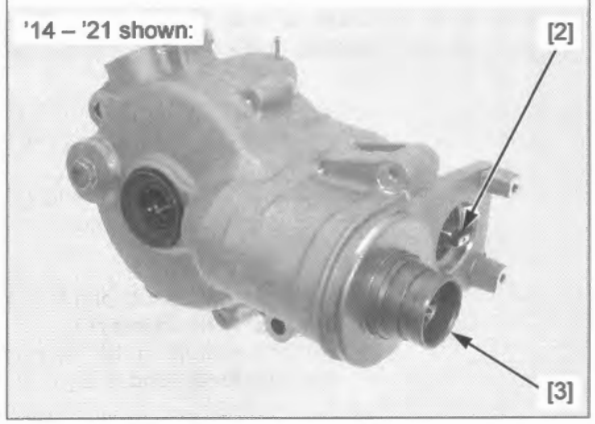
Shift the drive mode to 4WD by rotating the screw shaft [2]. Then, while rotating the pinion gear by the final clutch joint [3], tighten the bolts to the specified torque in a crisscross pattern in several steps.

TORQUE: 26 N·m (2.7 kgf·m, 19 lbf·ft)

Make sure that the gear assembly rotates smoothly without binding.

Install the difflock actuator to the front final drive (page 21-22).



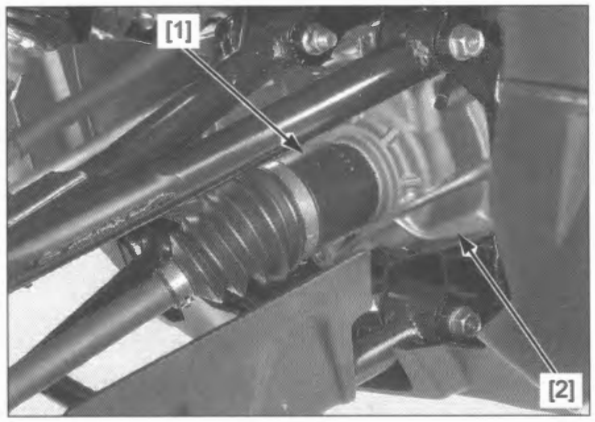


FRONT FINAL DRIVE INSTALLATION

Place the final gear case assembly into the frame.

If both drive shafts are removed, install them after mounting the gear case assembly completely.

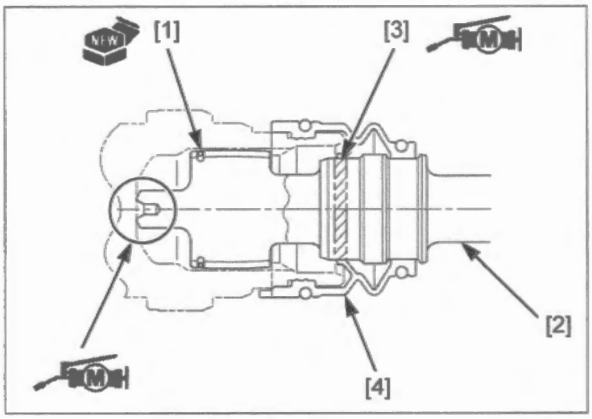
Install the right drive shaft [1] into the gear case [2]. (page 21-32).



Install a new stopper ring [1] into the groove in the propeller shaft [2].

Apply molybdenum disulfide grease to the seal lip [3] of the front side boot [4].
Make sure the seal lip is not turned inside out.

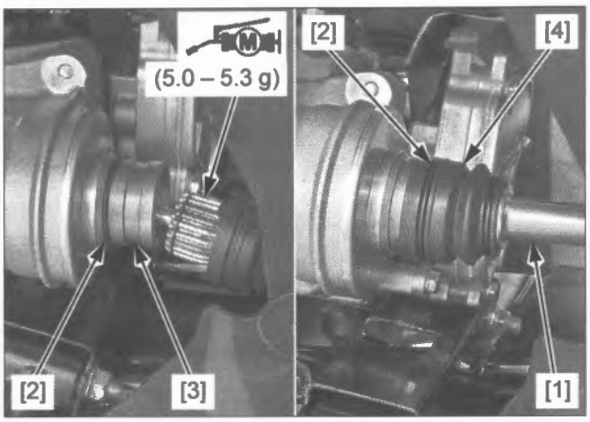
Apply molybdenum disulfide grease to the front end of the propeller shaft.



Apply 5.0 – 5.3 g (0.18 – 0.19 oz) of molybdenum disulfide grease to the splines of the propeller shaft [1].
Place the boot band [2] over the final clutch joint temporarily.

Install the propeller shaft into the final clutch joint [3], aligning the splines until the stopper ring seats in the groove.
Make sure the stopper ring is seated properly by pulling the propeller shaft lightly.

Install the boot [4] over the final clutch joint groove securely and the boot band into the boot groove.



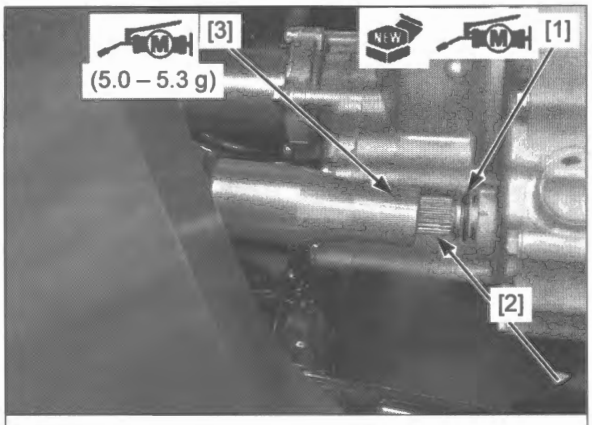
Coat a new O-ring [1] with molybdenum disulfide grease and install it into the groove of the output shaft [2].

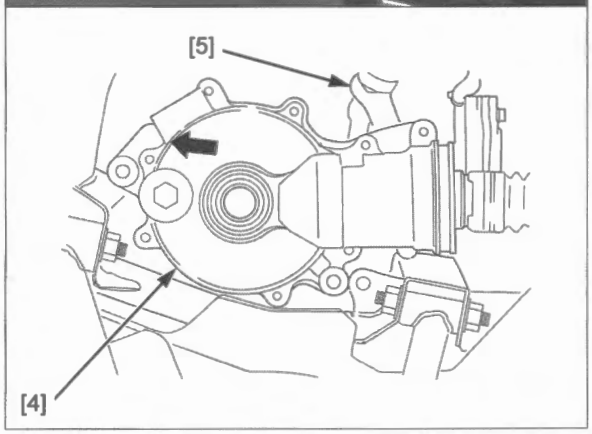
Apply 5.0 – 5.3 g (0.18 – 0.19 oz) of molybdenum disulfide grease to the splines of the propeller shaft joint [3].
Move the gear case assembly [4] forward for maximum clearance between the shaft joint and output shaft.

NOTE:

- Turn the handlebar all the way to the right to move the gear case assembly.
- Put some cloth on the gear case to avoid scratch or damage the tie-rod end [5].

Engage the shaft joint over the output shaft and move the gear case assembly rearward.





Align the rear mounting bolt holes in the gear case and frame, then install the mounting bolt [1] from the right side and a new mounting nut [2].

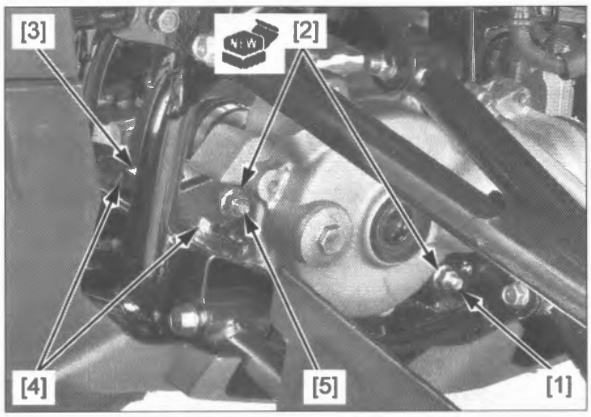
Install the mounting bracket [3] with the bolts [4].
Install the front mounting bolt [5] from the right side and a new mounting nut.

Tighten all the gear case mounting fasteners in the following sequence.

– Rear mounting nut
– Mounting bracket bolts
– Front mounting nut

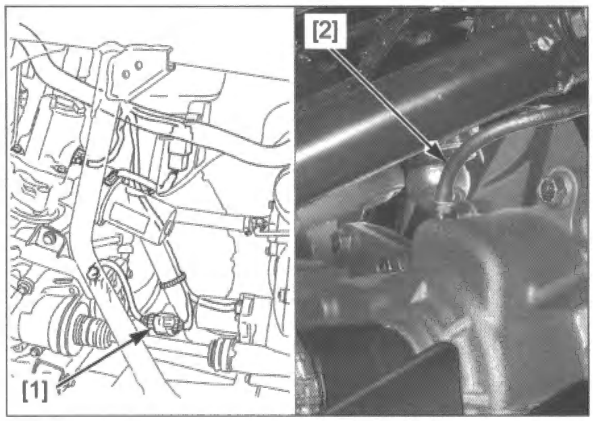
TORQUE:

Rear mounting nut: 44 N·m (4.5 kgf·m, 32 lbf·ft)
Front mounting nut: 44 N·m (4.5 kgf·m, 32 lbf·ft)



Route the wires properly (page 1-31).

Connect the difflock actuator 10 P (Gray) connector [1].
Secure the wire with the wire band [2].



FA models only:

Install the front VS sensor (page 13-66).

Connect the front final drive breather hose [3].

Install the following:

- tank cover assembly (page 2-4)
- left drive shaft (page 21-25)

Fill the gear case with the recommended oil (page 3-21).

MEMO

22. REAR DRIVING MECHANISM

SERVICE INFORMATION 22-2

TROUBLESHOOTING 22-4

SYSTEM COMPONENTS 22-5

REAR AXLE (FM1/FM2/FE1/FE2) 22-7

REAR DRIVE SHAFT (FM5/FM6/FM7/FA5/FA6/FA7) 22-12

REAR FINAL DRIVE (FM1/FM2/FE1/FE2) 22-19

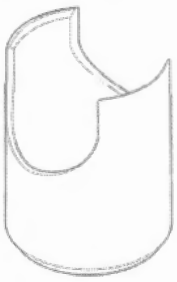
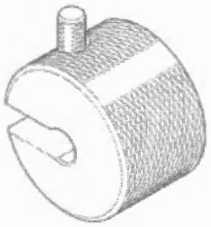
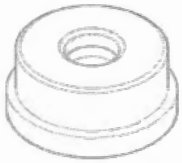
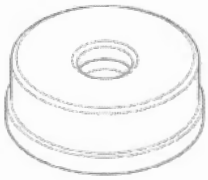
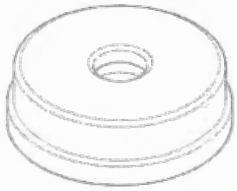
REAR FINAL DRIVE (FM5/FM6/FM7/FA5/FA6/FA7) 22-33

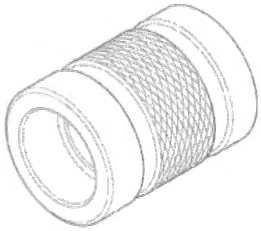
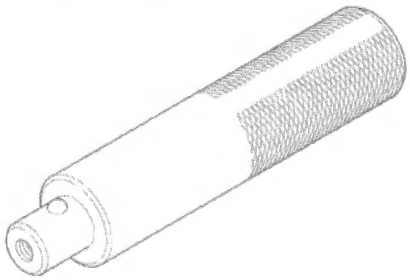
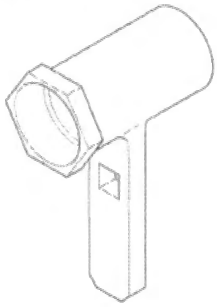
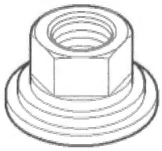
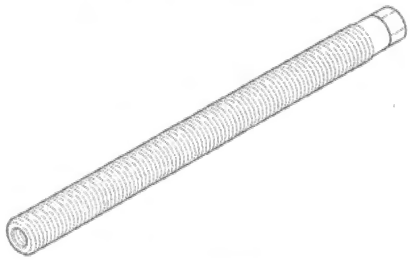
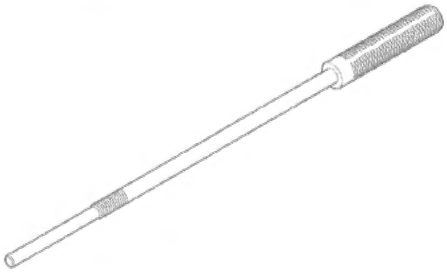
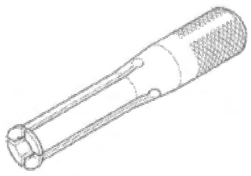
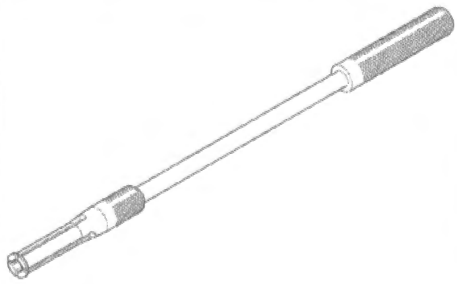
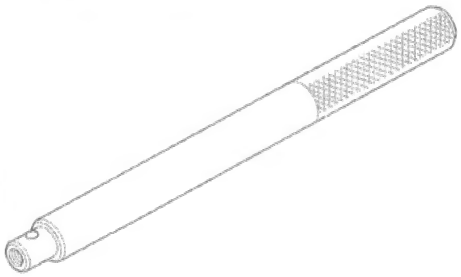
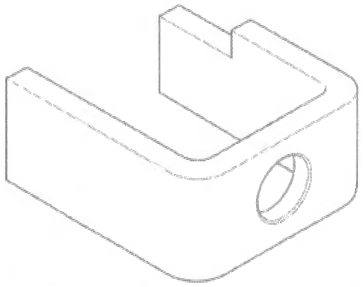
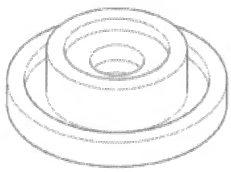
SERVICE INFORMATION

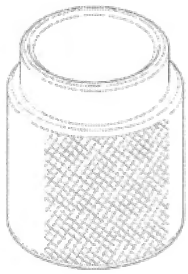
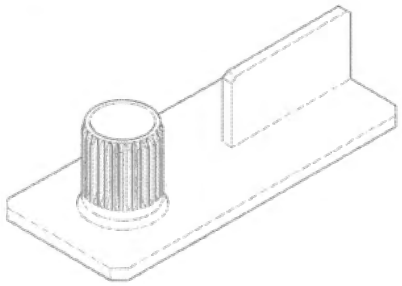
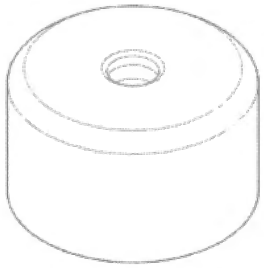
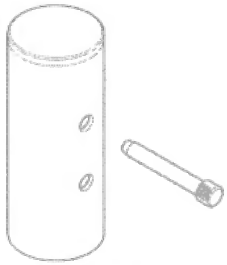
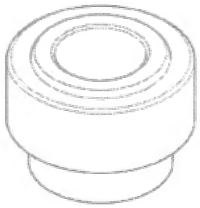
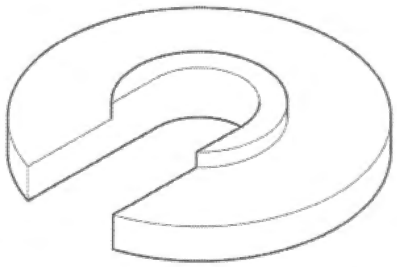
GENERAL

- Perform the gear contact pattern and backlash inspection whenever you replace the bearings, gears or gear case. The extension lines from the gear engagement surfaces should intersect at one point.
- Protect the gear case with a shop towel or soft jaws while holding it in vise. Do not clamp it too tight as it could damage the gear case.
- When using the lock nut wrench, use a deflecting beam type torque wrench 20 inches long. The lock nut wrench increases the torque wrench's leverage, so the torque wrench reading will be less than the torque actually applied to the nut. The specification given is the actual torque applied to the lock nut, not the reading on the torque wrench. Do not overtighten the lock nut. The specification later in the text gives both actual and indicated.
- Replace the ring and pinion gears as a set.

TOOLS

Compressor Diff Bearing Clip 26 mm 070ME-HP50100  or 070ME-HP5A100 (U.S.A. only)	Remover Weight 07741-0010201  or 07936-371020A (U.S.A. only)	Attachment, 42 x 47 mm 07746-0010300 
Attachment, 52 x 55 mm 07746-0010400 	Attachment, 62 x 68 mm 07746-0010500 	Attachment, 24 x 26 mm 07746-0010700 
Attachment, 35 mm I.D. 07746-0030400 	Pilot, 15 mm 07746-0040300 	Pilot, 35 mm 07746-0040800 

Fork Seal Driver Weight 07747-0010100  07AAF-S3VA101 (U.S.A. only)	Driver 07749-0010000 	Locknut Wrench 36 x 47.8 07916-MB00002 
Special nut 07931-HB3020A (U.S.A. only) 	Threaded Shaft 16 x 1.5 x 120L 07931-ME40000  Not available in U.S.A.	Puller shaft 07931-ME4010B (U.S.A. only) 
Remover Shaft, 15 mm 07936-KC10100  Not available in U.S.A.	Remover Head, 15 mm 07936-KC10200  Not available in U.S.A.	Bearing remover, 15 mm 07936-KC10500 (U.S.A. only) 
Driver 07949-3710001 	Pinion Puller Base 07HMC-MM80110  or 07HMC-MM8011A (U.S.A. only)	Oil Seal Driver 07GAD-PG40100 

Pilot, 32 mm 07MAD-PR90200 	Fork Seal Driver, 39.2 mm 07947-4630100 	Pinion holder 07SMB-HM70200 
Driver attachment 07LAD-PW50500 	Oil seal driver 07965-KE80200  Not available in U.S.A.	Attachment, 30 mm 07746-0030300 
Holding tool Snap-on YA6010A or equivalent 	Half shaft disassembly plate 070MF-HR3A100 (U.S.A. only) 	

TROUBLESHOOTING

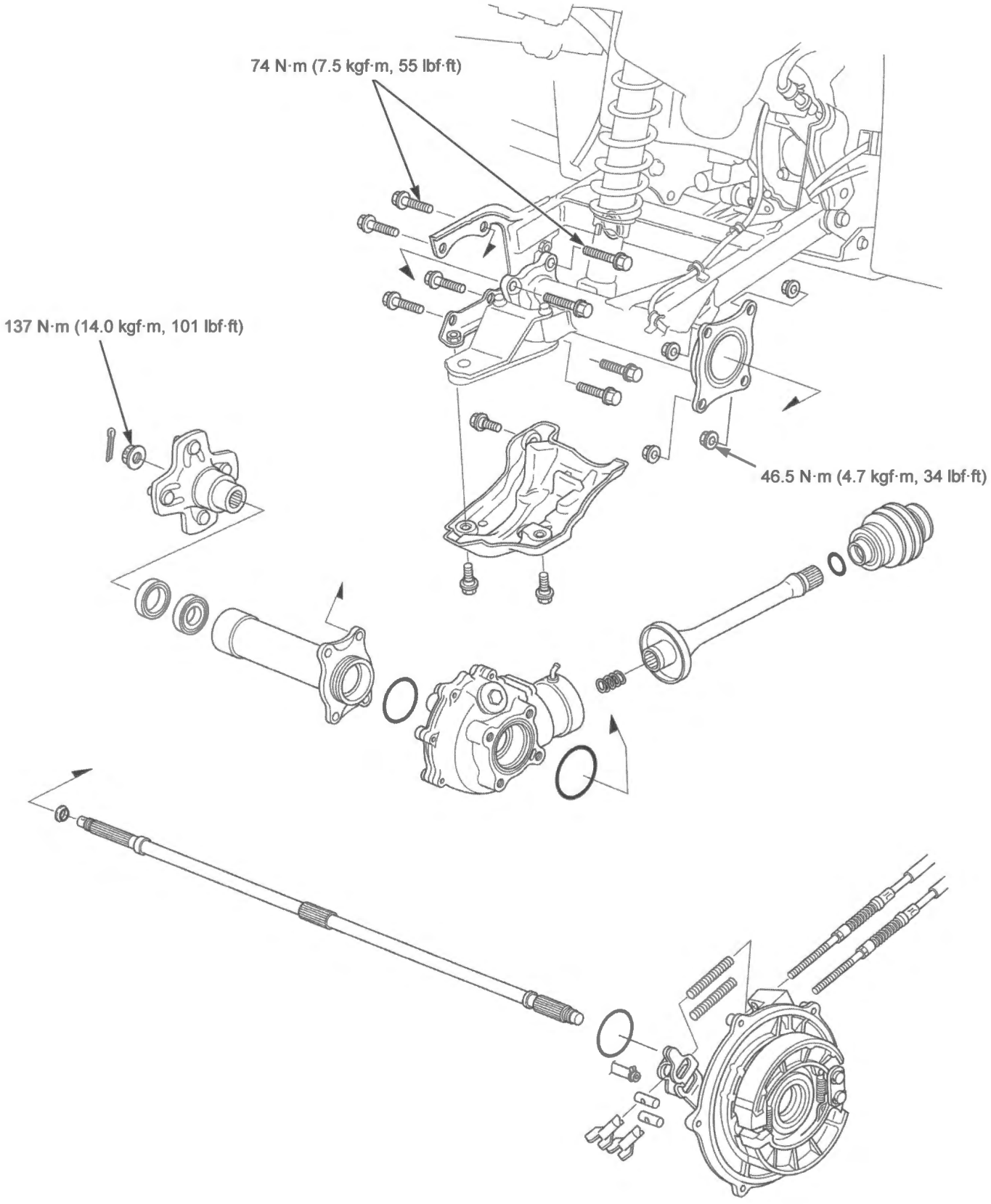
Excessive noise
- Worn or scored ring gear and axle splines
- Worn or scored pinion gear and propeller shaft splines
- Worn or damaged bearing
- Worn pinion and ring gears
- Excessive backlash between pinion and ring gears
- Oil level too low

Wobble or vibration in vehicle
- Axle not tightened properly
- Bent axle

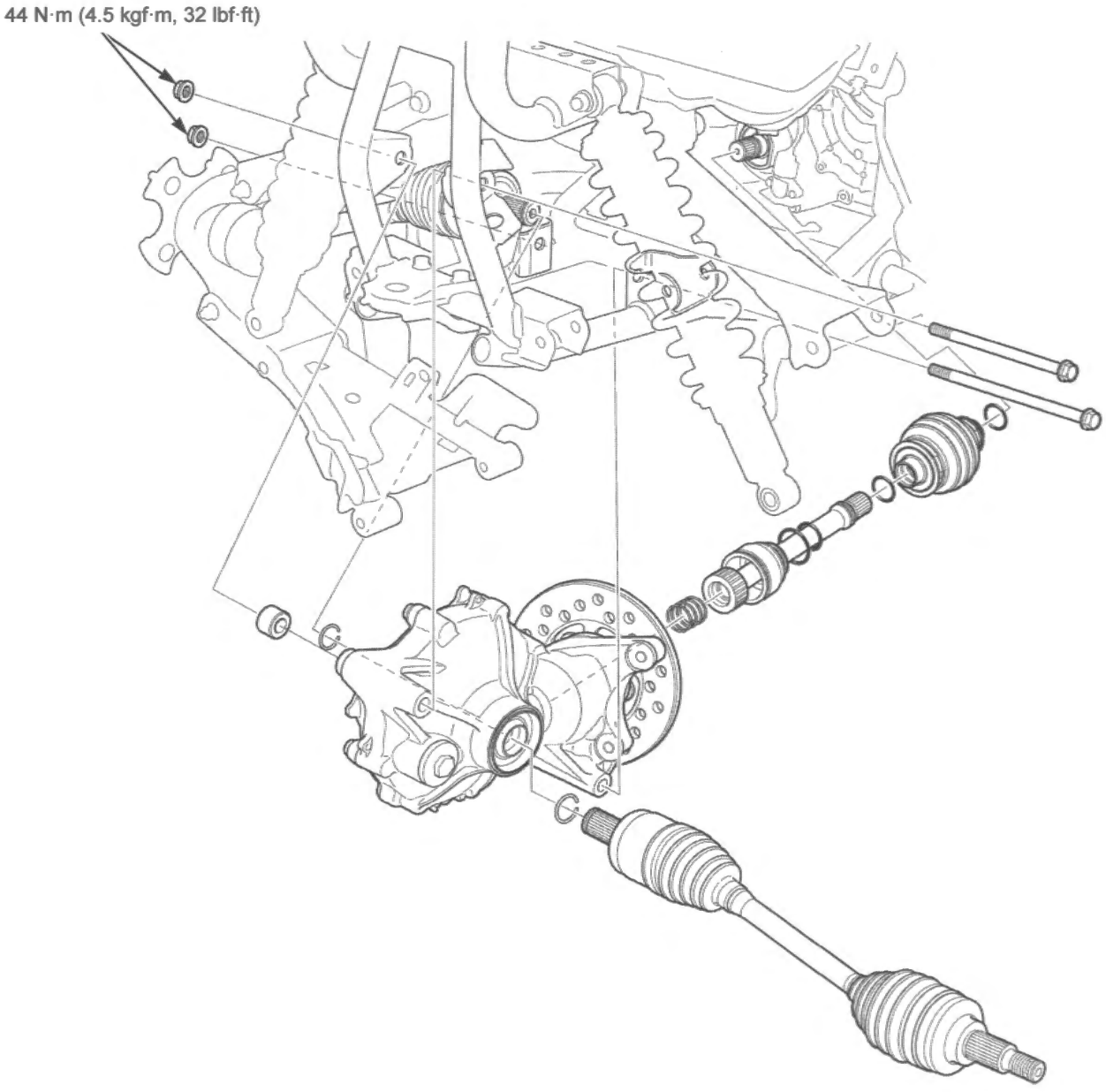
Oil leak
- Oil level too high
- Clogged breather
- Damaged seals
- Loose case cover bolt

SYSTEM COMPONENTS

FM1/FM2/FE1/FE2:



FM5/FM6/FM7/FA5/FA6/FA7:



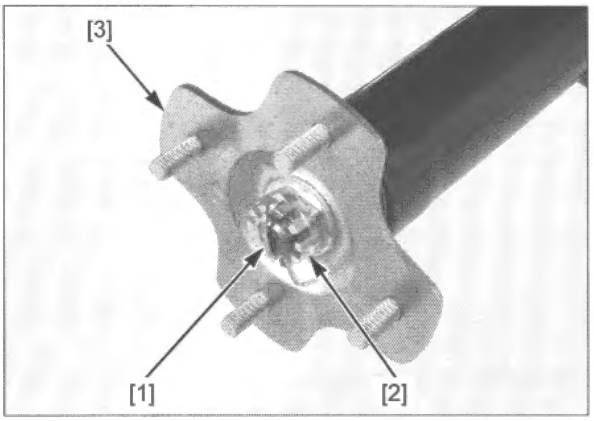
REAR AXLE (FM1/FM2/FE1/FE2)

REMOVAL

Remove the rear wheels (page 19-6).

Remove the cotter pin [1] and loosen the hub nut [2] while applying the rear brake.
Remove the hub nut and rear wheel hub [3].

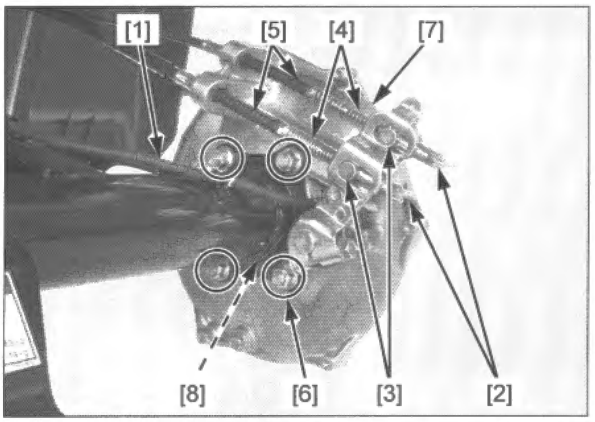
Remove the brake drum (page 20-16).



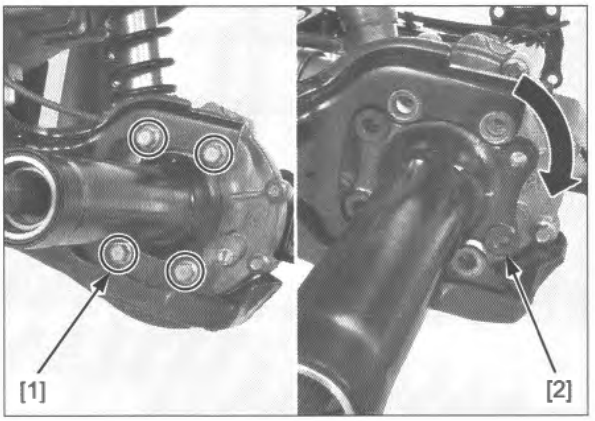
Do not get grease onto the brake shoe linings.

Remove the following:

- breather hose [1]
- adjusting nuts [2]
- joint pins [3]
- springs [4]
- brake cables [5]
- four panel nuts [6]
- brake panel assembly [7]
- O-ring [8] (from the brake panel)

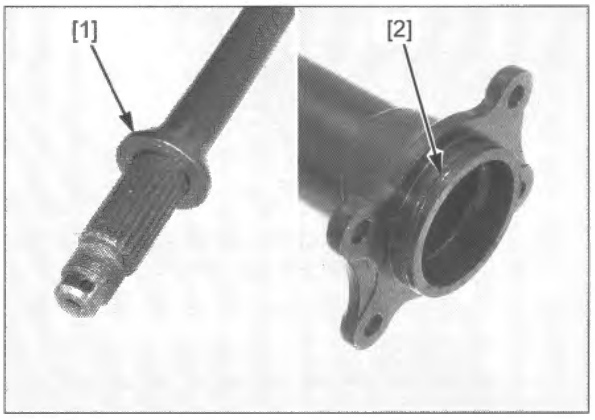


Remove the four bolts [1], turn the left axle housing [2] 90 degrees and remove it.

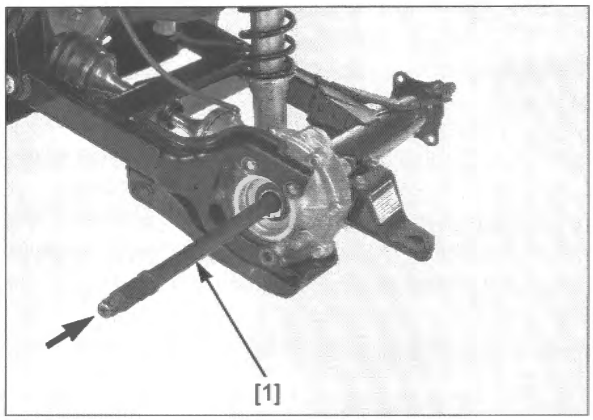


Remove the side collar [1].

Remove the O-ring [2] from the left axle housing.



Remove the rear axle [1] by driving it from the left side using a rubber mallet.

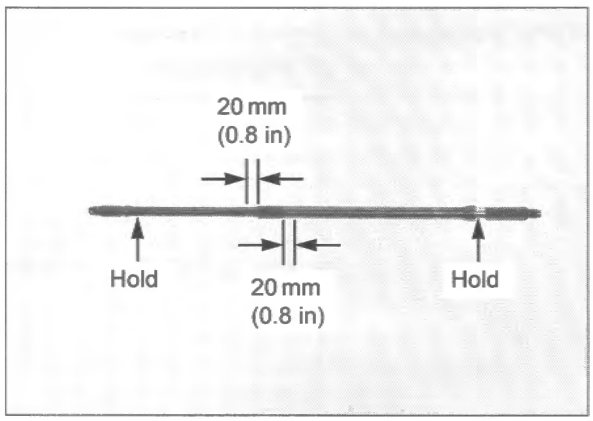


INSPECTION

AXLE

Set the axle in V-blocks and measure the axle runout with a dial indicator.
Axle runout is 1/2 the total indicator reading.

SERVICE LIMIT: 3.0 mm (0.12 in)



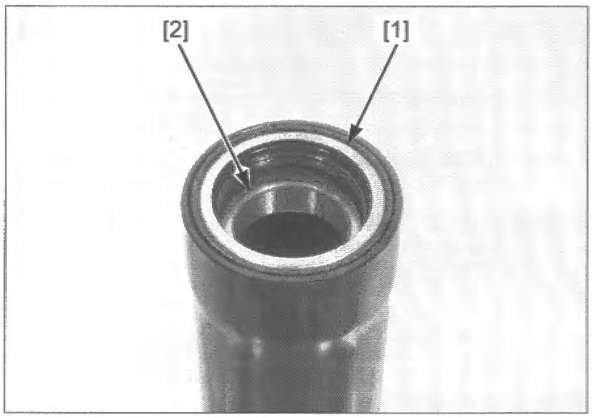
AXLE BEARING

Turn the inner race of the bearing with your finger.
The bearing should turn smoothly and quietly.
Also check that the bearing outer race fits tightly in the axle housing and brake panel.

BEARING REPLACEMENT

AXLE HOUSING

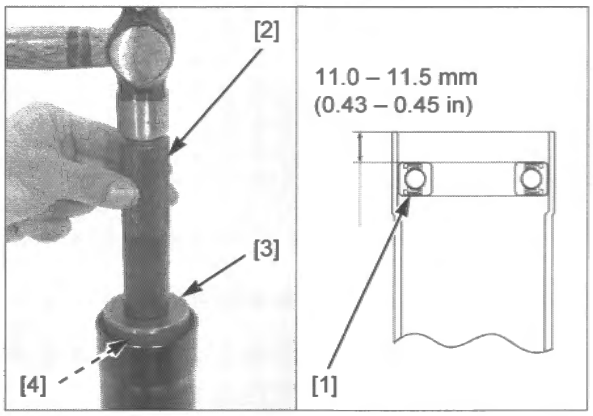
Remove the dust seal [1] and drive the axle bearing [2] out of the axle housing.



Press the bearing [1] into the axle housing until the depth from the housing edge is 11.0 – 11.5 mm (0.43 – 0.45 in).

TOOLS:

[2] Driver	**07749-0010000**
[3] Attachment, 52 x 55 mm	**07746-0010400**
[4] Pilot, 32 mm	**07MAD-PR90200**

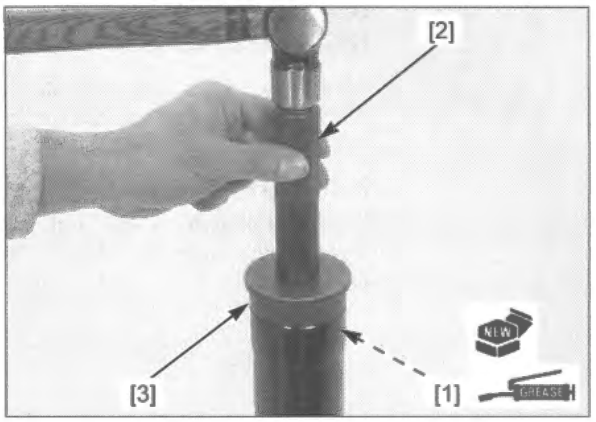


Apply grease to the lip of a new dust seal [1].

Install the dust seal with the metal plate side facing up so that it is flush with the axle housing end.

TOOLS:

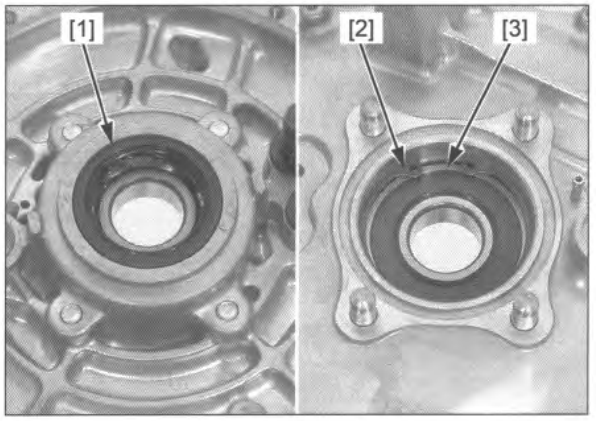
[2] Driver	**07749-0010000**
[3] Attachment, 62 x 68 mm	**07746-0010500**



BRAKE PANEL

Remove the dust seal [1] and snap ring [2].

Drive the axle bearing [3] out of the brake panel.



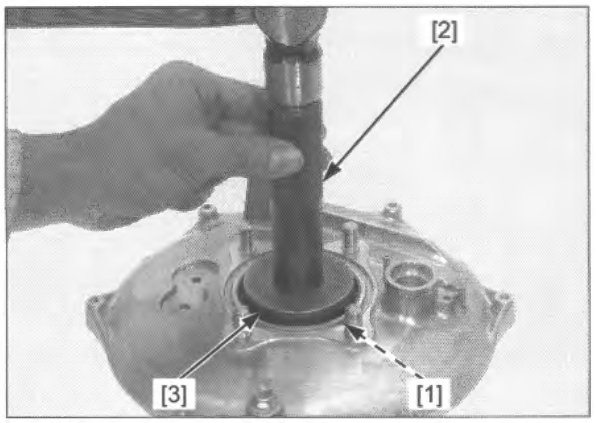
Fill up a new bearing with 4.0 – 5.0 g (0.14 – 0.18 oz) of grease.

Support the bearing housing section of the brake panel when installing.

Drive a new bearing [1] squarely with the sealed side facing up until it is fully seated.

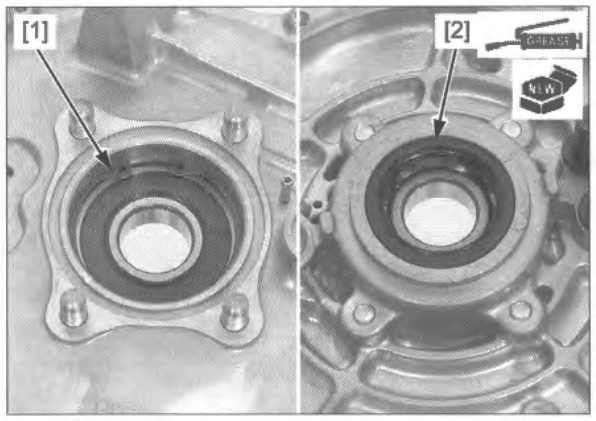
TOOLS:

[2] Driver	**07749-0010000**
[3] Attachment, 62 x 68 mm	**07746-0010500**



Install the snap ring [1] with the chamfered edge facing the bearing securely.

Apply grease to the lip of a new dust seal [2].
Install the dust seal with the flat side facing up so that it is flush with the panel.

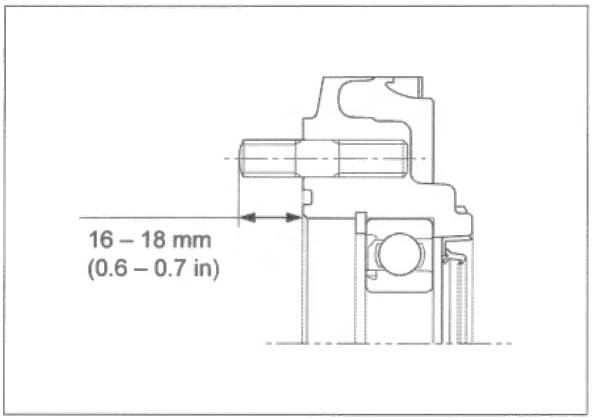


REAR BRAKE PANEL STUD BOLT REPLACEMENT

Thread two nuts onto the stud bolt and tighten them together, and use a wrench on them to turn the stud bolt out.

Install new stud bolts

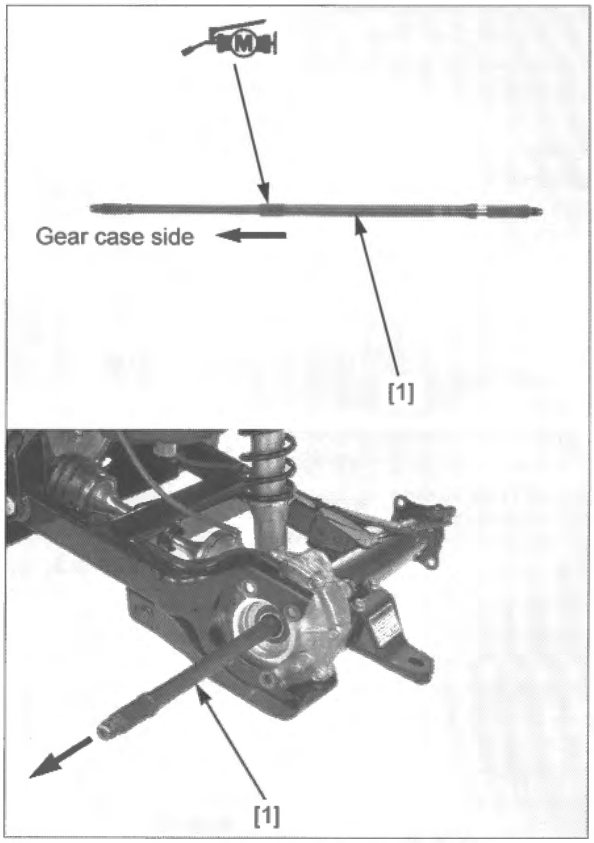
After installation, check that the length from the bolt head to the steering bearing holder surface is within specification.



INSTALLATION

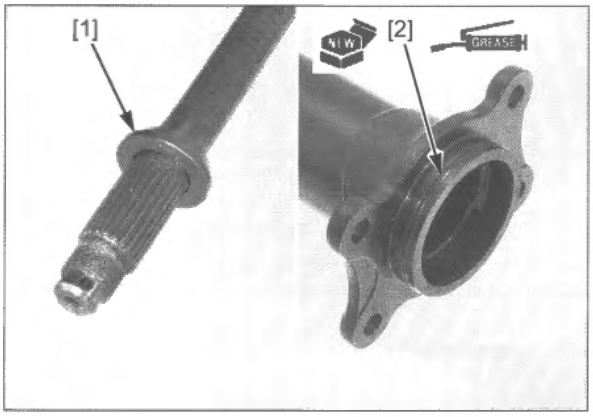
Apply molybdenum disulfide grease to the center spline (ring gear contacting area) of the axle [1].

Install the axle into the final gear case from the right side until it is fully seated.



Install the side collar [1] onto the rear axle with the tapered side facing inward.

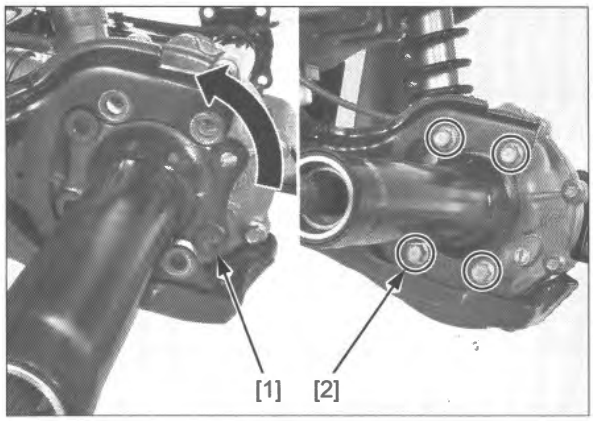
Coat a new O-ring [2] with grease and install it into the groove in the left axle housing.



Install the left axle housing [1] and turn it 90 degrees.

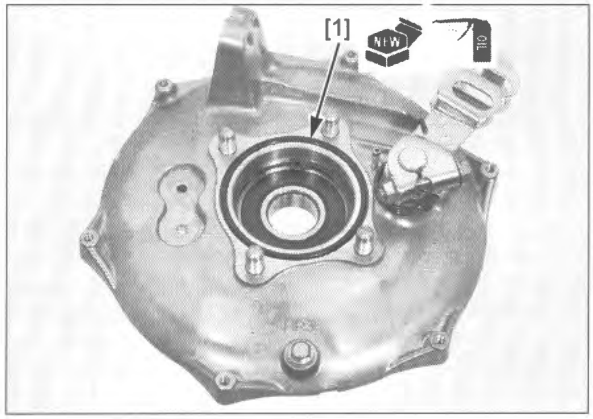
Install the four mounting bolts [2] and tighten them to the specified torque.

TORQUE: 74 N·m (7.5 kgf·m, 55 lbf·ft)



Do not get grease onto the brake shoe linings.

Coat a new O-ring [1] with grease and install it into the panel groove.



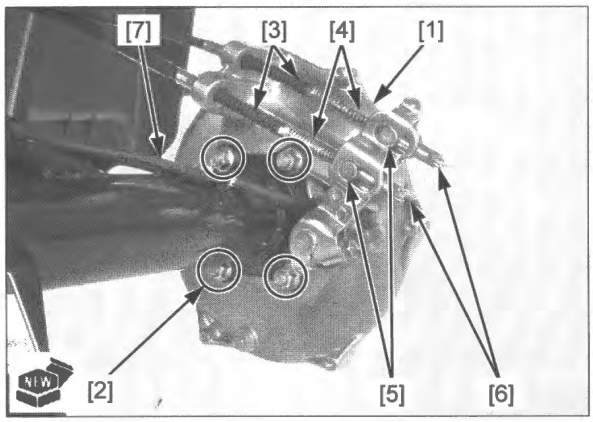
Do not get grease on the brake shoe linings.

Install the brake panel assembly [1] onto the axle.
Install new brake panel nuts [2] and tighten them to the specified torque.

TORQUE: 46.5 N·m (4.7 kgf·m, 34 lbf·ft)

Install the brake cables [3] into the cable holders of the brake panel (upper holder for lever brake cable and lower holder for pedal brake cable).
Install the cable springs [4] onto the cables.
Connect the brake cables to the brake arm with the joint pins [5] and adjusting nuts [6].

Connect the breather hose [7] to the hose joint on the brake panel.



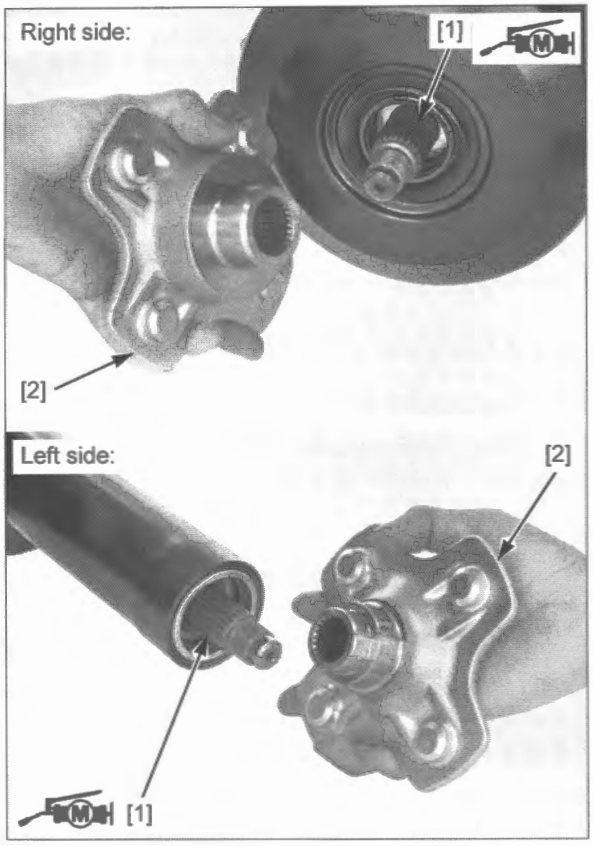
Whenever removing both hub nuts, first tighten right side, then tighten the left side.

Install the brake drum (torque the hub nut) (page 20-19).

Apply molybdenum disulfide grease to the axle spline [1].

Do not get grease on the axle threads.

Install the wheel hub [2] onto the axle.



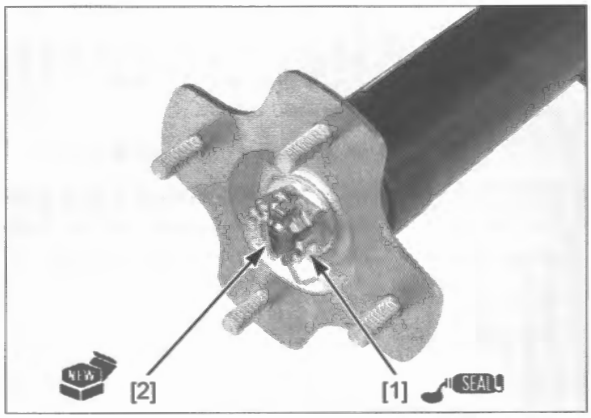
Apply sealant to the hub nut threads (page 1-17).
Install the hub nut [1].
Apply rear brake and tighten hub nut to the specified torque and further tighten it until its grooves align with the cotter pin hole.

TORQUE: 137 N·m (14.0 kgf·m, 101 lbf·ft)

Install a new cotter pin [2].

Install the rear wheels (page 19-6).

Fill the gear case with the recommended oil (page 3-19).



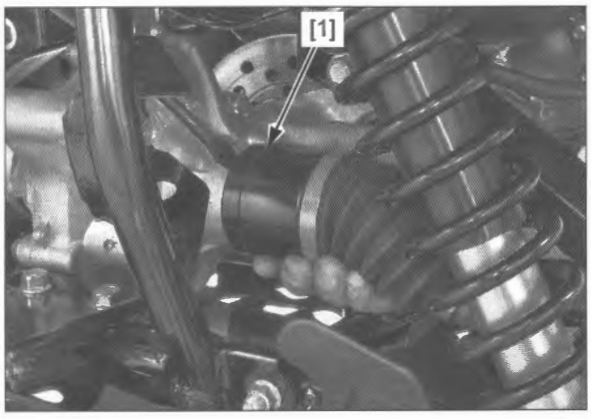
REAR DRIVE SHAFT (FM5/FM6/FM7/ FA5/FA6/FA7)

REMOVAL/INSTALLATION

Remove the rear wheel hub/knuckle (page 19-10).

To prevent damage to the oil seal, hold the inboard joint horizontal until the drive shaft is clear of the gear case.

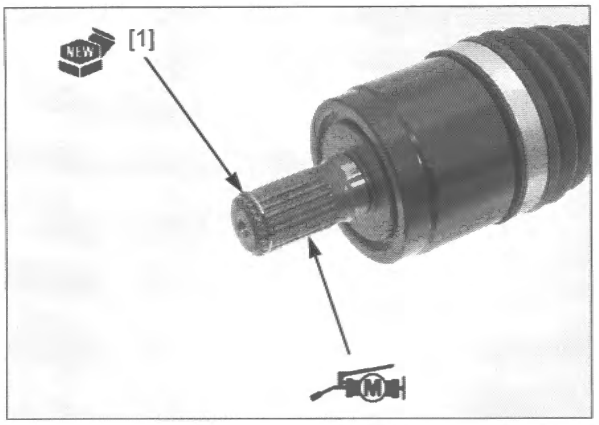
Hold the inboard joint [1] of the drive shaft and tug firmly to force the stopper ring on the inboard joint end past the groove while prying with a screwdriver.



Remove the stopper ring [1] from the inboard joint.

Install a new stopper ring into the groove in the inboard joint spline.

Apply molybdenum disulfide grease to the inboard joint spline.

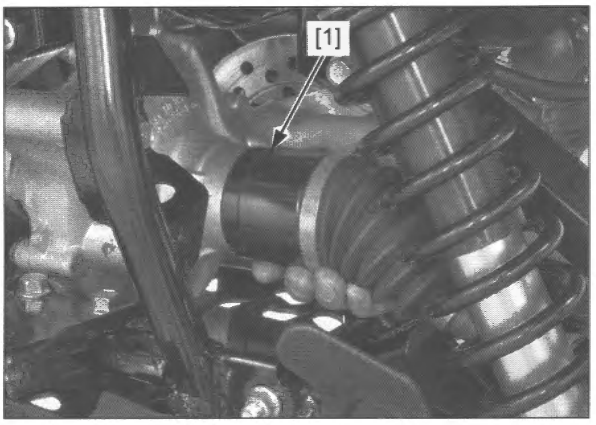


Be careful not to damage the oil seal in the gear case.

Install the drive shaft by holding the inboard joint [1] until the stopper ring seats in the groove of the differential.

Make sure that the stopper ring is seated properly by pulling on the inboard joint lightly.

Install the rear wheel hub/knuckle (page 19-12).

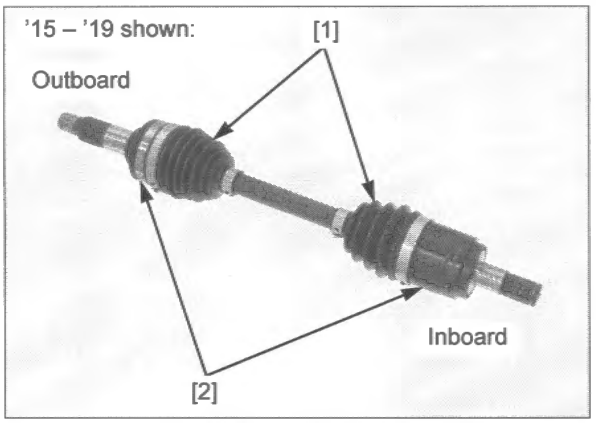


DISASSEMBLY/INSPECTION

Check the boots [1] for cuts or other damage.
Check the drive shaft joints [2] for excessive play or noise by moving the joints in a circular direction.
If the outboard joint seems to be worn or damaged, the drive shaft must be replaced.

NOTE:

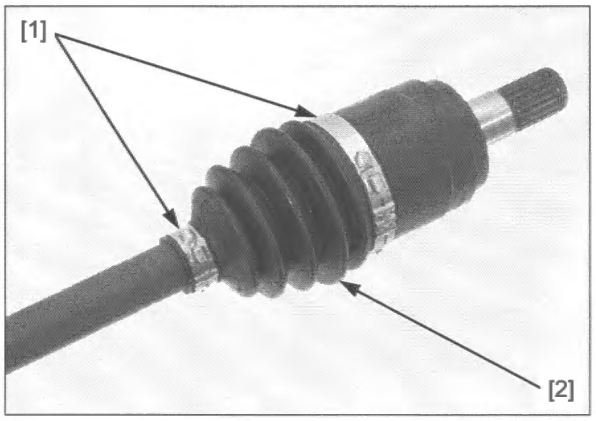
- To replace the outboard boot, first remove the inboard boot as described in following steps. Then remove bands and the outboard boot off the inboard end of the shaft.
- The outboard joint cannot be disassembled.



Replace the band with new ones whenever removing them.

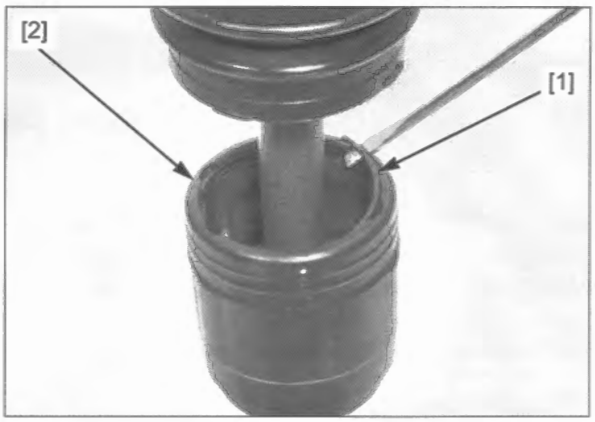
Cut off and remove the boot bands [1] from inboard boot [2].

Remove the boot from the inboard joint.



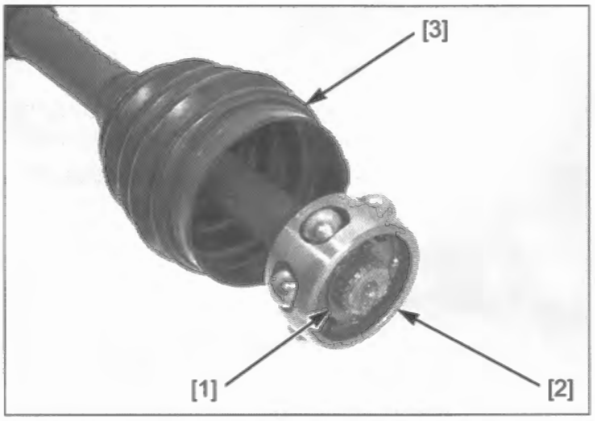
Remove the following:

- stopper ring [1]
- inboard joint [2]



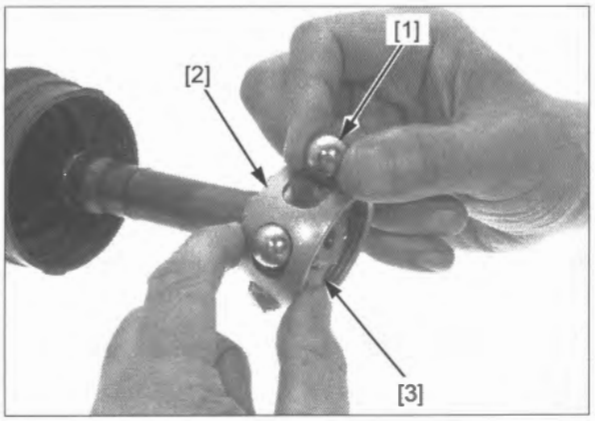
'15 – '19: Remove the following:

- snap ring [1]
- bearing [2]
- inboard boot [3]



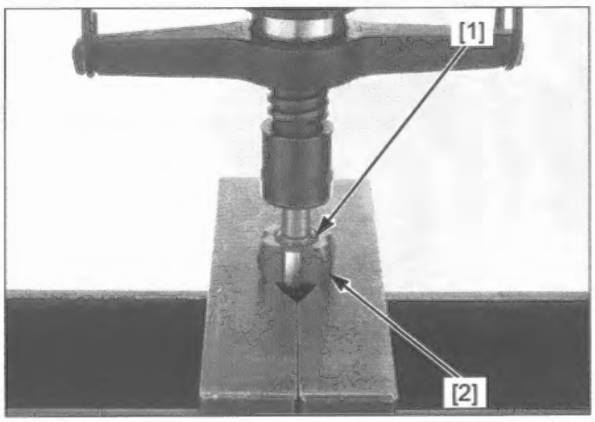
After '19: Remove the balls [1] from the bearing cage [2] and inner race [3] by tilting the cage as shown.

Slide the bearing cage down into the inboard boot.



After '19: Except U.S.A.:

While holding the drive shaft [1], press it out of the inner race [2] using a suitable tool as shown.

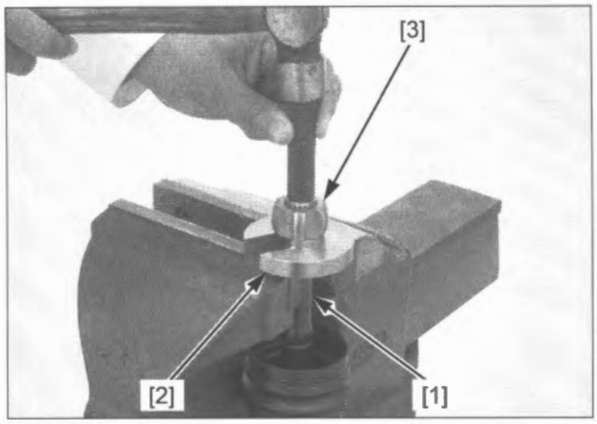


After '19: U.S.A. only:

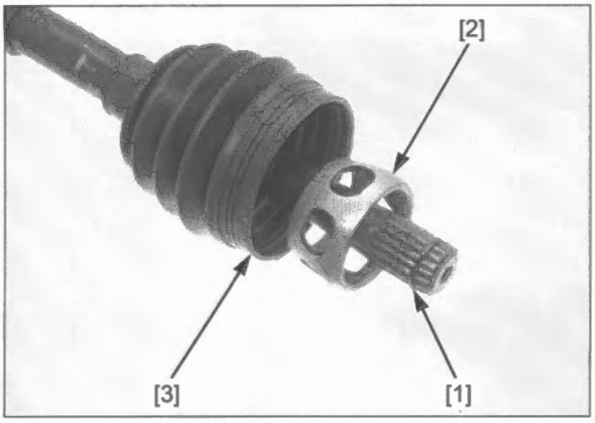
Place the drive shaft [1] in a vise using a special tool. Do not tighten the vise onto the shaft.

TOOL:
Half shaft disassembly plate [2] 070MF-HR3A100

While holding the drive shaft, drive it out of the inner race [3] using a suitable rod.



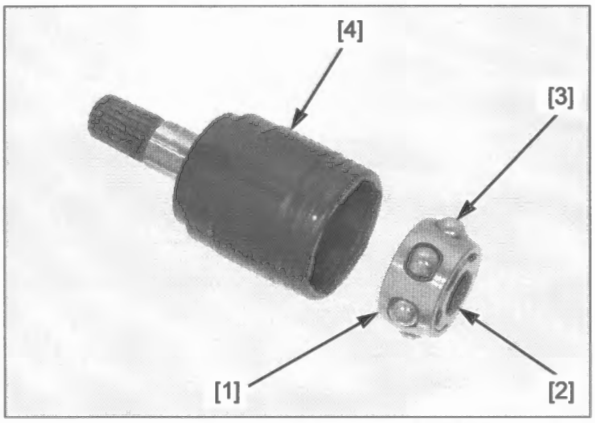
After '19: Remove the stopper ring [1], inner race [2] and inboard boot [3] from the drive shaft.



Replace these components as an assembly.

Check the following for wear or damage.

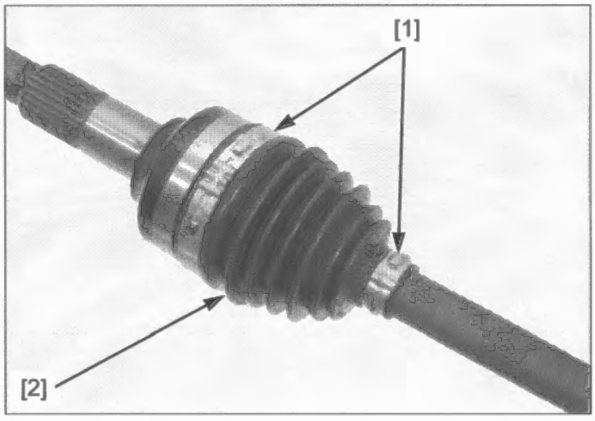
- bearing cage [1]
- race [2]
- steel balls [3]
- inboard joint [4]



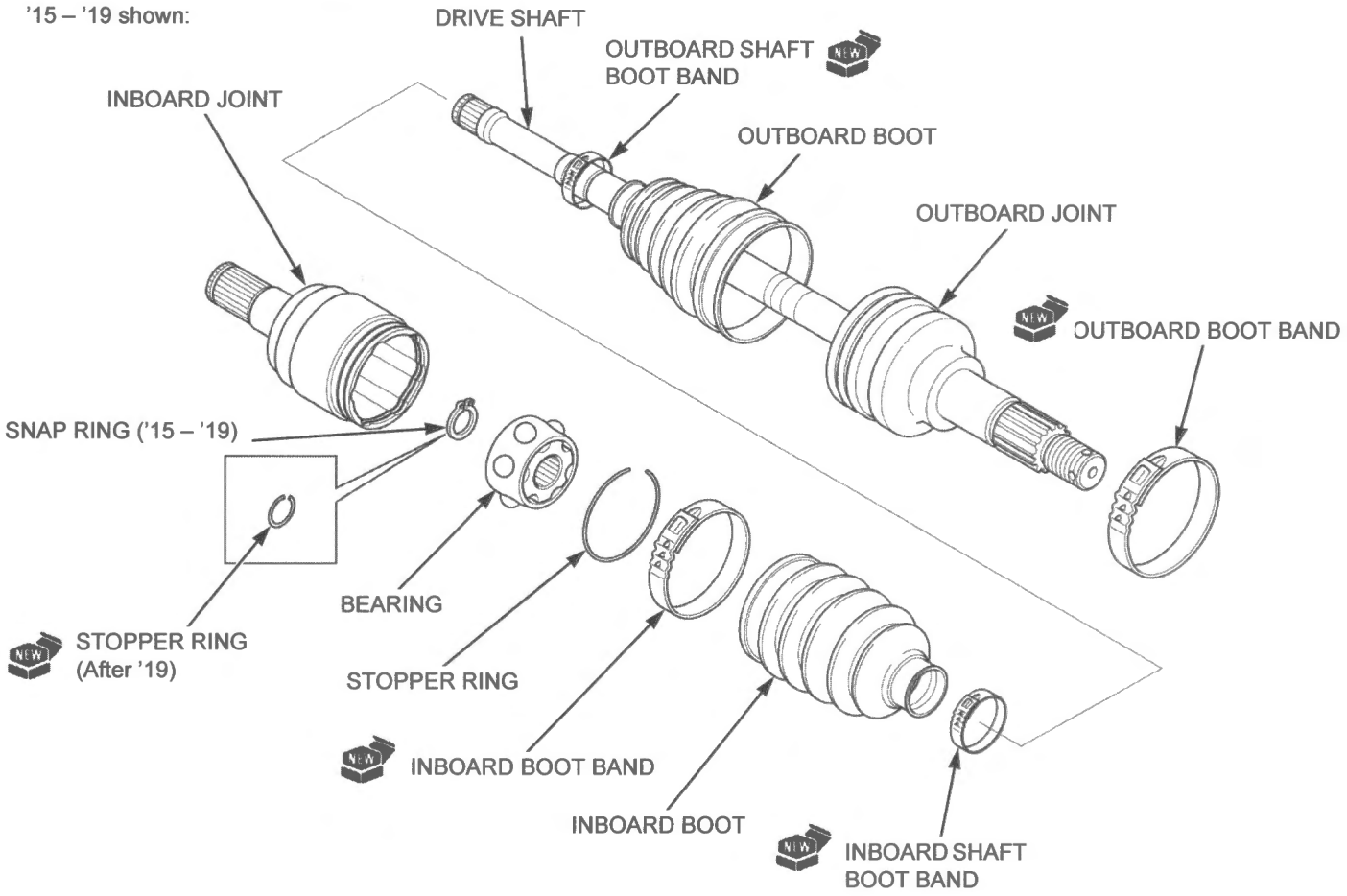
Replace the bands with new ones whenever removing them.

Cut off and remove the boot bands [1] from outboard boot [2].

Remove the outboard boot.

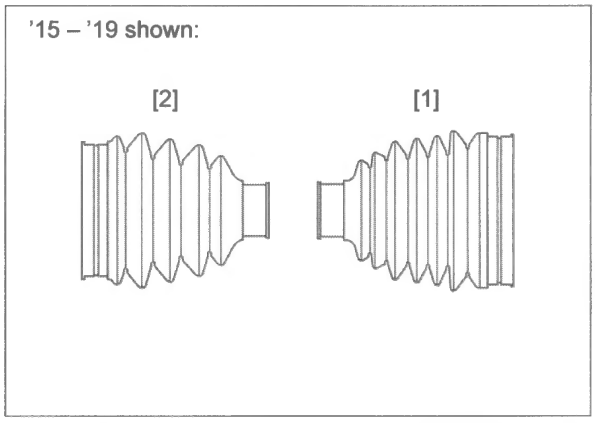


ASSEMBLY



Pack the inboard and outboard joint insides with specified grease.

The outboard boot [1] is larger than the inboard boot [2]. Do not interchange them.



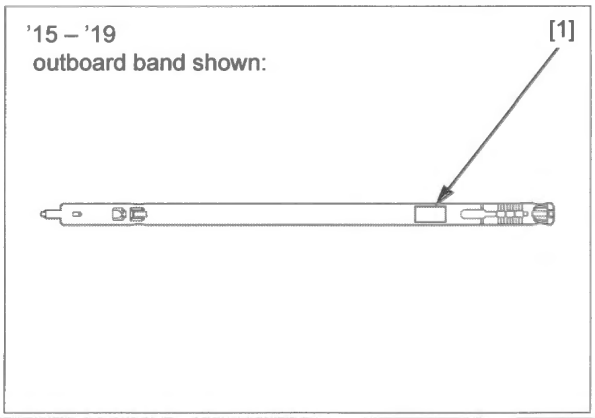
Each band has following identification number. Do not interchange them.

'15 – '19:

INBOARD SHAFT BOOT BAND:	**25**
INBOARD BOOT BAND:	**72.5**
OUTBOARD SHAFT BOOT BAND:	**24**
OUTBOARD BOOT BAND:	**69**

After '19:

INBOARD SHAFT BOOT BAND:	**25.5**
INBOARD BOOT BAND:	**66.8**
OUTBOARD SHAFT BOOT BAND:	**0248**
OUTBOARD BOOT BAND:	**0755**



Pack the outboard joint with specified grease.

'15 – '19:

Specified grease: NKG509 (Kyodo Yushi)
Volume: 40 – 60 g (1.4 – 2.1 oz)

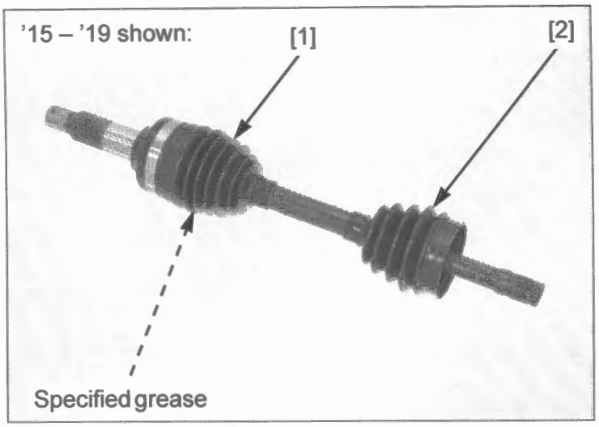
After '19:

Specified grease: Oilstomoly 2 LN 584 LO (Castrol)
Volume: 70 – 90 g (2.5 – 3.2 oz)

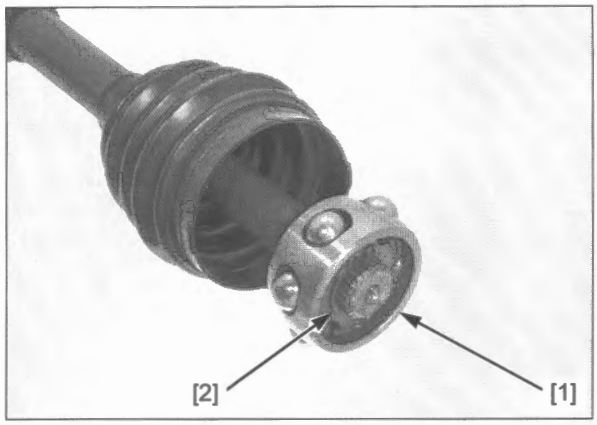
Install the following:

- outboard boot [1]
- inboard boot [2]

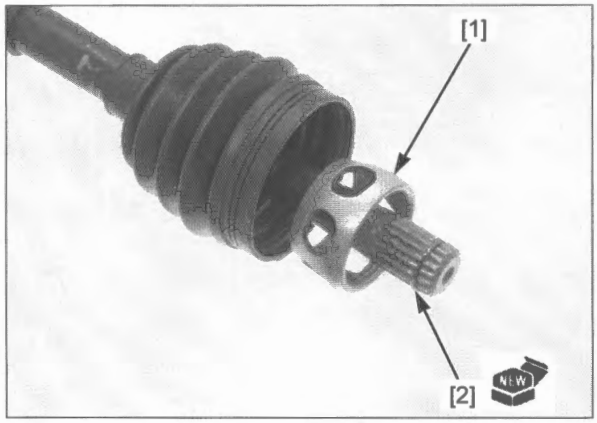
Do not tighten the bands at this time.



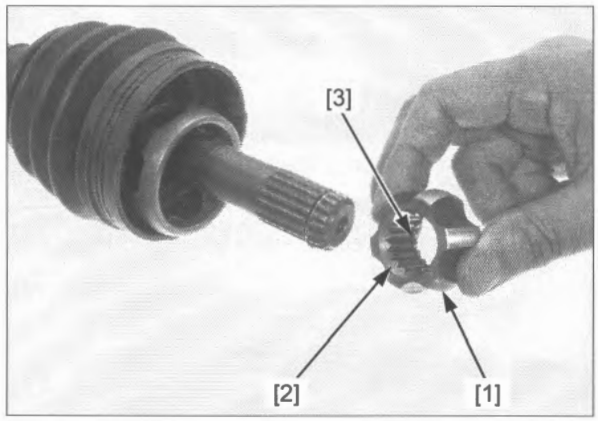
'15 – '19: Install the bearing [1] with the small O.D. facing the drive shaft.
Install the snap ring [2] with the chamfered side facing the bearing.



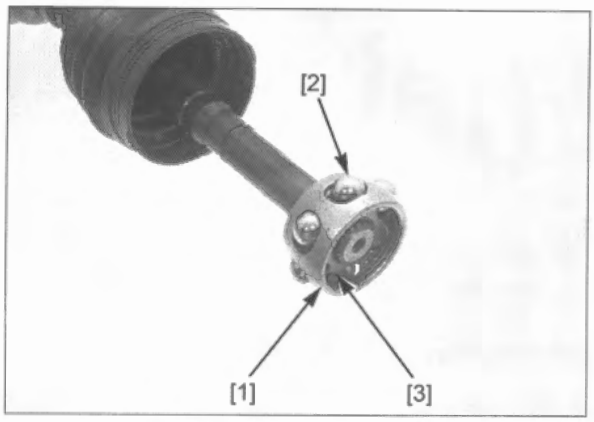
After '19: Install the bearing cage [1] with the small O.D. facing the drive shaft.
Install a new stopper ring [2] into the drive shaft groove.



After '19: Install the inner race [1] with the chamfered I.D. [2] facing the drive shaft (ring groove [3] side facing opposite side).
Drive the shaft with a copper hammer until the stopper ring seats in the ring groove.



After '19: Assemble the bearing cage [1] and six balls [2] onto the inner race [3].



Pack the inboard joint with specified grease.

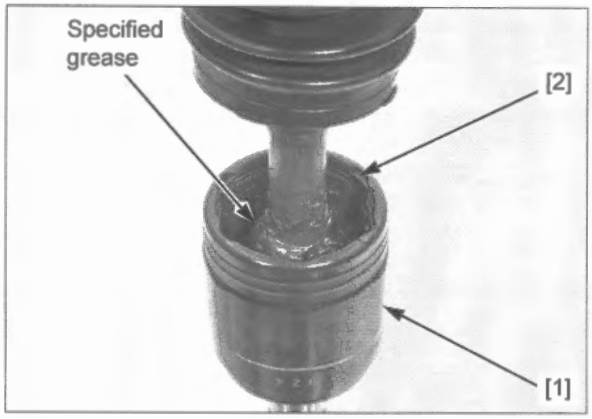
'15 – '19:

Specified grease: NKG509 (Kyodo Yushi)
Volume: 60 – 80 g (2.1 – 2.8 oz)

After '19:

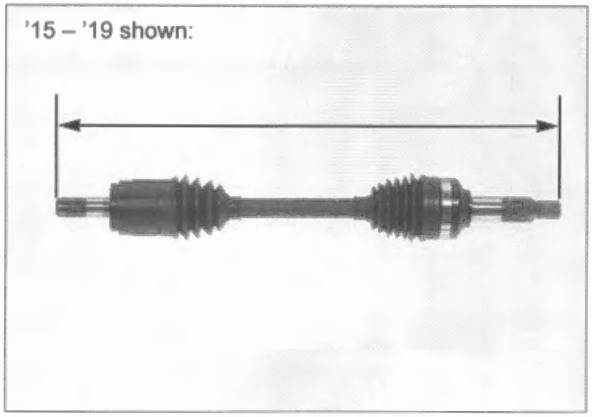
Specified grease: Oilstomoly 2 LN 584 LO (Castrol)
Volume: 70 – 90 g (2.5 – 3.2 oz)

Install the inboard joint [1] over the bearing.
Install the stopper ring [2] into the groove in the inboard joint properly.
Install the boot over the inboard joint.



Adjust the length of the drive shaft to the figure given below.

REAR DRIVE SHAFT LENGTH:
'15 – '19:
Left/Right: 540.2 mm (21.27 in)
After '19:
Left/Right: 519.5 mm (20.45 in)

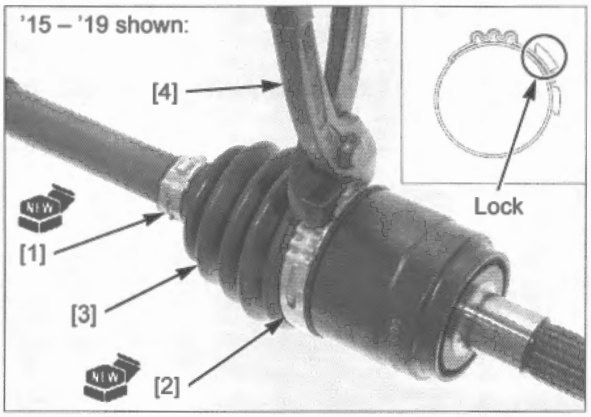


Install new shaft boot band [1] and inboard boot band [2] onto the inboard boot [3].

NOTE:
- Installation direction of the band (page 22-16).

Lock the boot bands using the following tool.

TOOL:
[4] CV Joint Band Pliers **OET 14100134 or equivalent**



'15 – '19: Install new shaft boot band [1] and outboard boot band [2] onto the outboard boot [3].

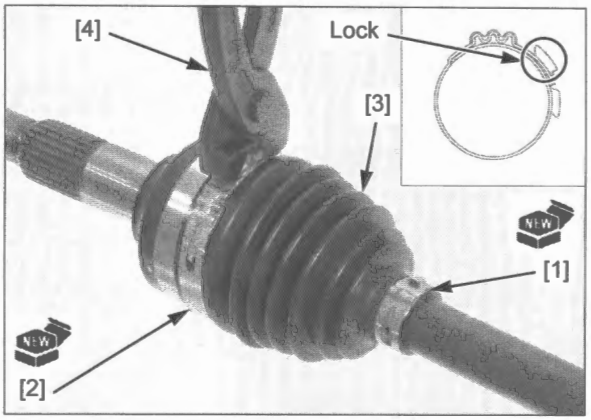
NOTE:

- Installation direction of the band (page 22-16).

Lock the boot bands using the following tool.

TOOL:

[4] CV Joint Band Pliers **OET 14100134 or equivalent**

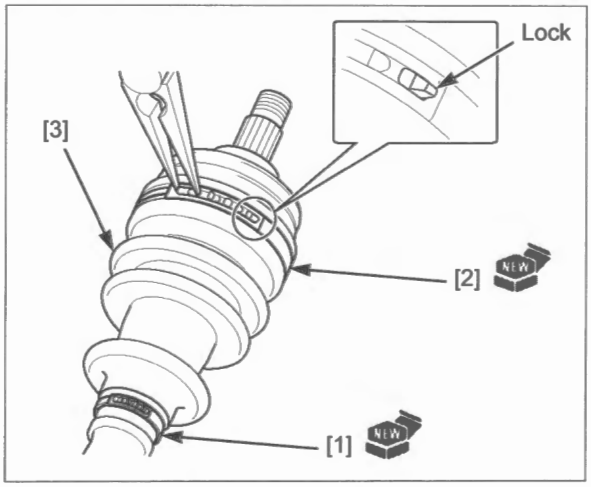


After '19: Install new shaft boot band [1] and outboard boot band [2] onto the outboard boot [3].

NOTE:

- Installation direction of the band (page 22-16).

Lock the boot bands.



REAR FINAL DRIVE (FM1/FM2/FE1/FE2)

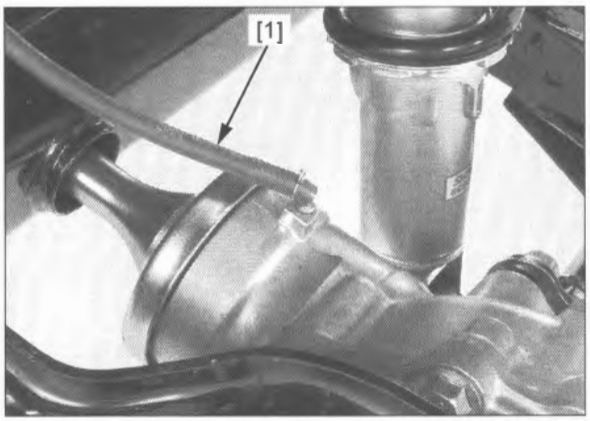
REMOVAL

Drain the gear case oil (page 3-19).

Remove the following:

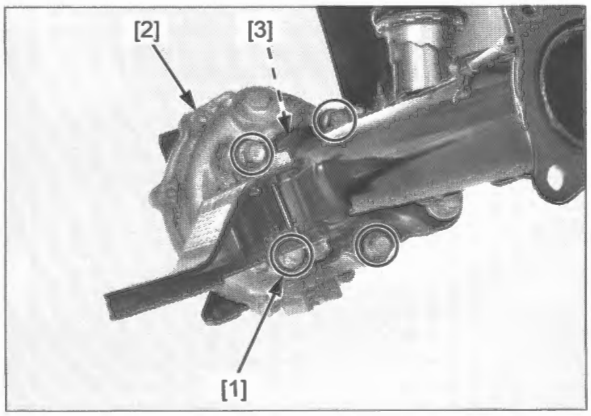
– skid plate (page 2-16)
– rear axle (page 22-7)

Disconnect the breather hose [1] from the final gear case.

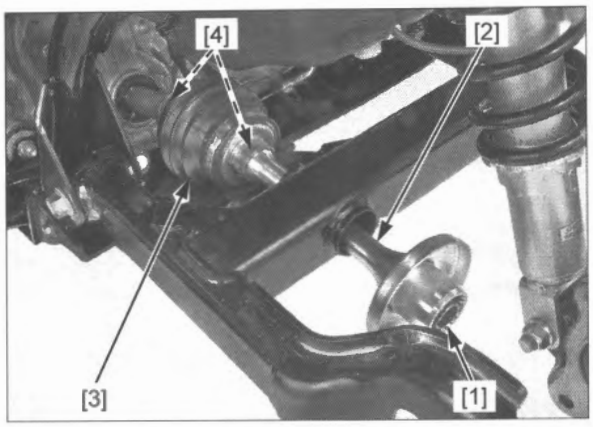


Remove the following:

– four bolts [1] (while supporting the gear case securely)
– gear case assembly [2]
– O-ring [3]



– joint spring [1]
– propeller shaft [2]
– universal joint [3]
– O-rings [4] (from the propeller shaft and output shaft)

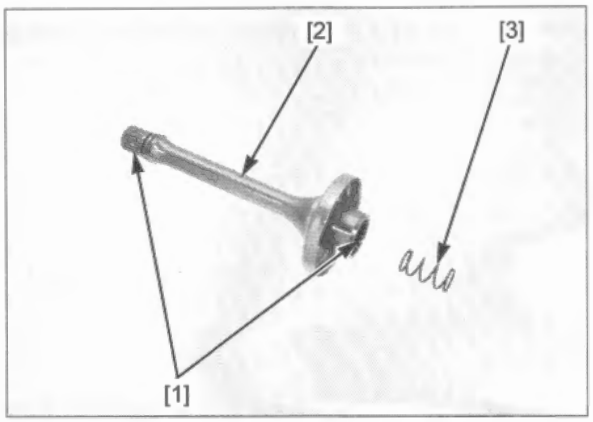


INSPECTION

PROPELLER SHAFT

Check the splines [1] of the propeller shaft [2] for wear or damage.
If they are damaged, check the pinion gear and universal joint splines also.

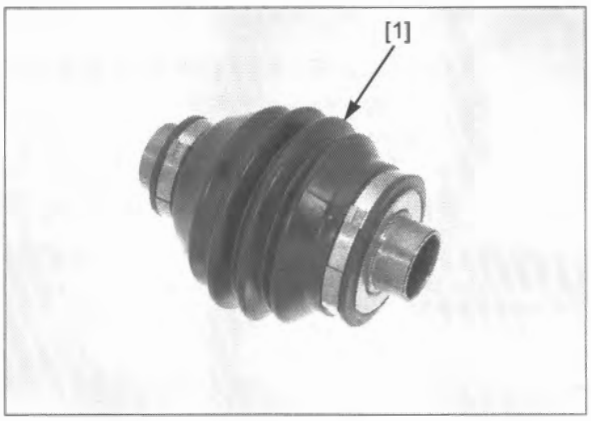
Check the joint spring [3] for fatigue or damage.



UNIVERSAL JOINT

Check the boot [1] for cuts or other damage.

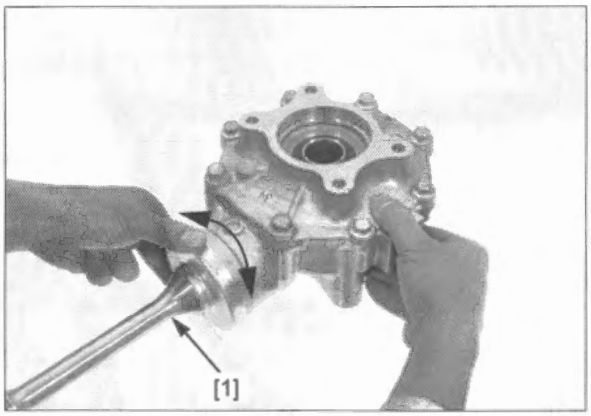
Check that the joint moves smoothly without binding or noise.



OPERATION CHECK

Temporarily install the propeller shaft [1].
Turn the propeller shaft and check that the gears turn smoothly and quietly without binding.

If the gears do not turn smoothly or quietly, the gears and/or bearing may be damaged or faulty.
They must be checked after disassembly; replace them if necessary.

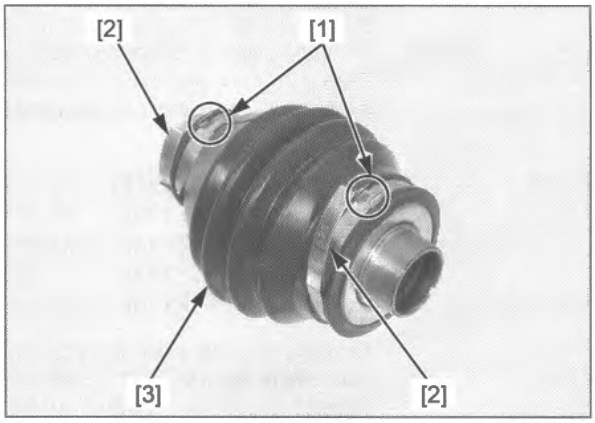


JOINT BOOT REPLACEMENT

Bend up the lock tabs [1] and raise each band end [2] to loosen the boot bands.

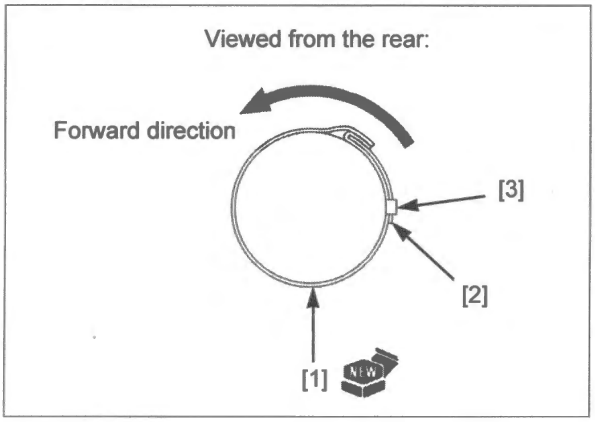
Remove the boot bands and joint boot [3].

Install a new boot and set it onto the universal joint properly.



Install new boot bands [1] so the band ends [2] are facing opposite the forward direction.

Bend down each band end and secure it with the lock tabs [3]. Tap the lock tabs with a plastic hammer.



BACKLASH INSPECTION

Remove the oil filler cap.
Set the gear case assembly in a vise.

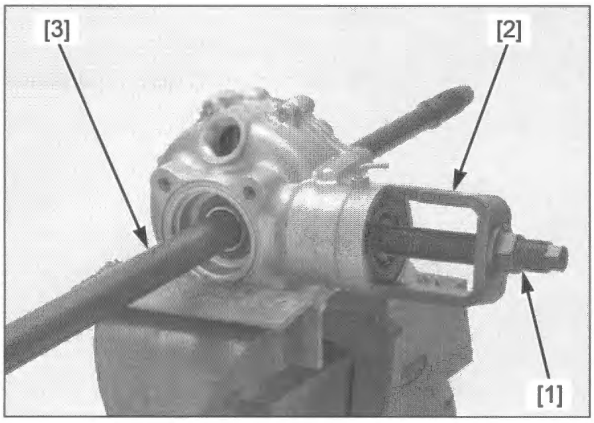
Hold the pinion gear with the special tools.

TOOLS:

[1] Threaded Shaft 16 x 1.5 x 120L	**07931-ME40000**
[2] Pinion Puller Base	**07HMC-MM80110**

U.S.A. TOOLS:

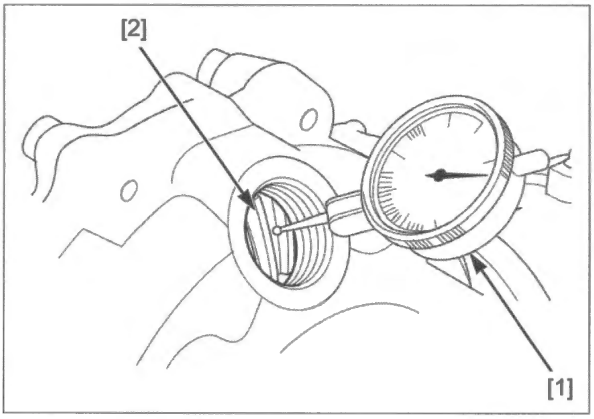
Puller shaft	**07931-ME4010B**
Special nut	**07931-HB3020A**
Pinion puller base	**07HMC-MM8011A**



Install the axle [3] into the gear case assembly from the right side (filler hole side).

Set a dial indicator [1] on the ring gear [2] through the oil filler hole.
Turn the ring gear back and forth with the axle to read backlash.

STANDARD: 0.05 – 0.25 mm (0.002 – 0.010 in)
SERVICE LIMIT: 0.4 mm (0.02 in)

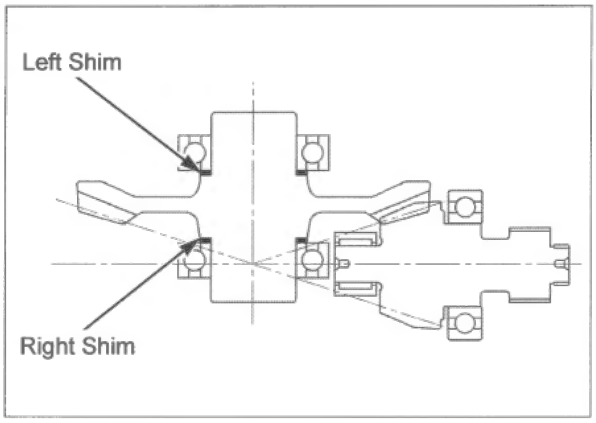


Remove the dial indicator. Turn the ring gear 120° and measure backlash. Repeat this procedure once more.
Compare the difference of the three measurements.

SERVICE LIMIT: 0.2 mm (0.01 in)

If the difference in measurements exceeds the service limit, it indicates that the bearing is not installed squarely, or the case is deformed.
Inspect the bearings and case.

If the backlash is excessive, replace the ring gear right side shim with a thinner one.
If the backlash is too small, replace the ring gear right side shim with a thicker one.
Backlash changed by about 0.06 mm (0.002 in) when thickness of the shim is changed by 0.12 mm (0.005 in).



Ring gear shims:

A: 1.82 mm (0.072 in)	**F: 2.12 mm (0.083 in)**
B: 1.88 mm (0.074 in)	**G: 2.18 mm (0.086 in)**
C: 1.94 mm (0.076 in)	**H: 2.24 mm (0.088 in)**
D: 2.00 mm (0.079 in)	**I: 2.30 mm (0.091 in)**
E: 2.06 mm (0.081 in)	

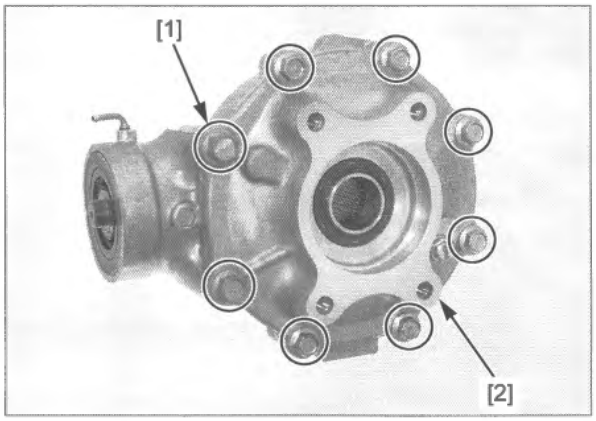
Change the left side shim as follows: If the right shim was replaced with a 0.12 mm (0.005 in) **thicker** shim, replace the left shim with one that is 0.12 mm (0.005 in) **thinner**.

REAR FINAL GEAR CASE DISASSEMBLY

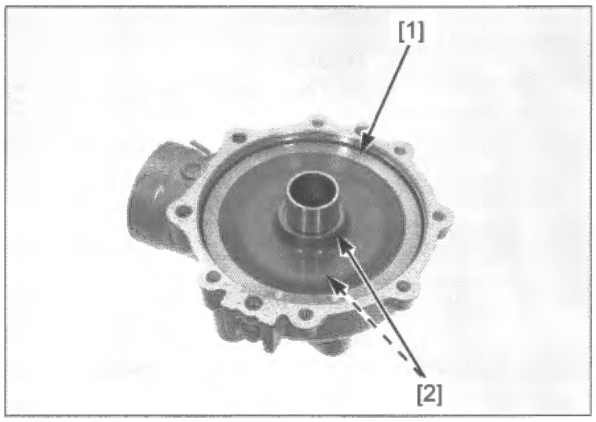
Loosen the eight cover bolts [1] in a crisscross pattern in several steps and remove them.

Be careful not to damage the mating surfaces.

Remove the case cover [2] by lightly tapping it.



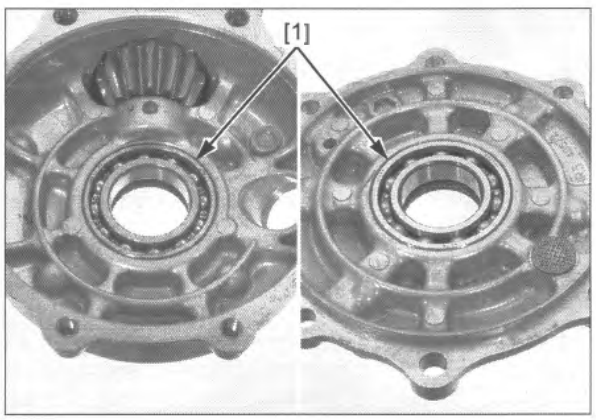
Remove the ring gear [1] and shims [2].



BEARING INSPECTION

Turn the inner race of each bearing [1] in the gear case and cover with your finger. The bearings should turn smoothly and quietly. Also check that the bearing outer race fits tightly in the case and cover.

Ring gear bearing replacement (page 22-12).



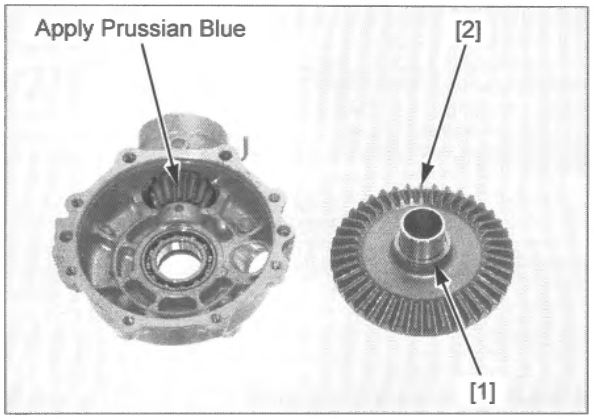
GEAR TOOTH CONTACT PATTERN CHECK

Keep dust and dirt out of the case and cover.

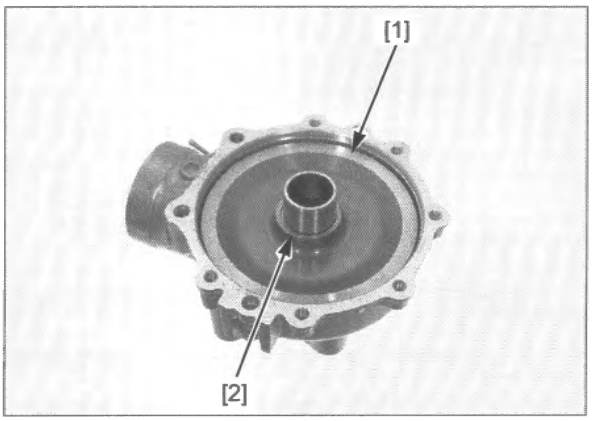
Clean sealing material off the mating surfaces of the gear case and cover, being careful not to damage them.

Apply thin coat of Prussian Blue to the pinion gear teeth for a tooth contact pattern check.

Install the right shim [1] onto the ring gear [2].



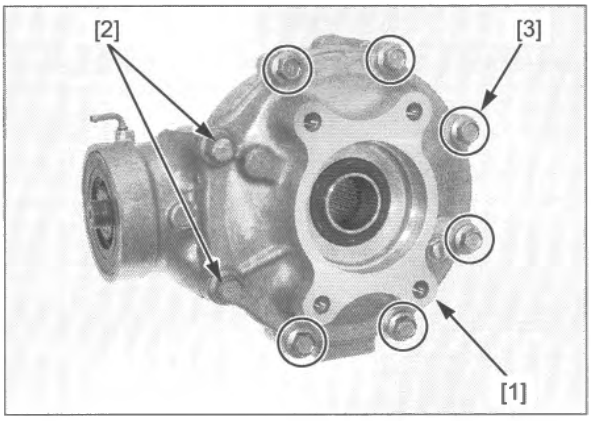
Install the ring gear [1] with the shim into the gear case.
Install the left shim [2] onto the ring gear.



It is important to turn the pinion gear while tightening the bolts. If the ring gear shim is too thick, the gears will lock after only light tightening.

Install the case cover [1], 10 mm bolts [2] and 8 mm bolts [3], and tighten the bolts in several steps until the cover evenly touches the gear case.
Then, while rotating the pinion gear, tighten the bolts to the specified torque in a crisscross pattern in several steps.

TORQUE:
10 mm bolt: 46.5 N·m (4.7 kgf·m, 34 lbf·ft)
8 mm bolt: 25 N·m (2.5 kgf·m, 18 lbf·ft)

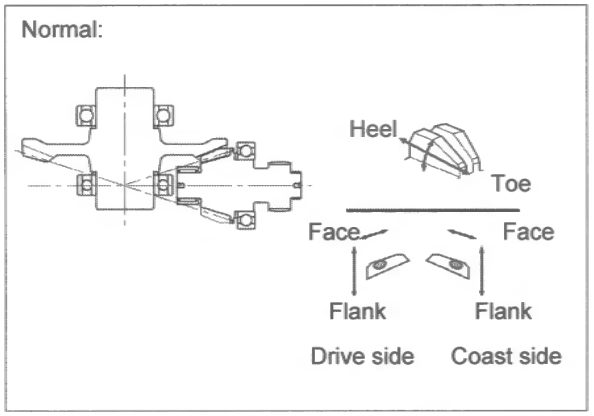


Remove the oil filler cap.

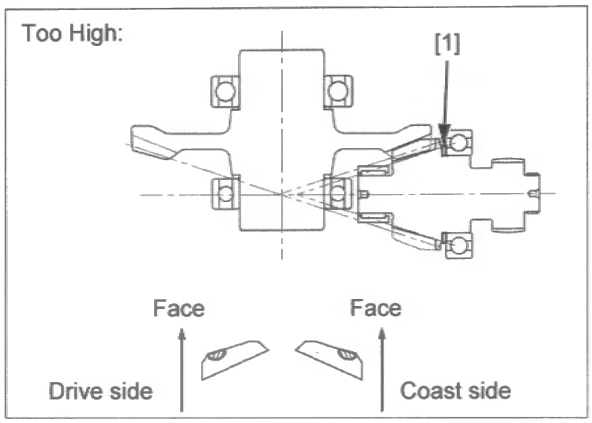
Rotate the ring gear several times in both directions of rotation.

Check the gear tooth contact pattern through the oil filler hole.
The pattern is indicated by the Prussian Blue applied to the pinion gear.
Contact is normal if the Prussian Blue is transferred to the approximate center of each tooth, but slightly to the heel side and to the flank side.

If the patterns are not correct, remove and change the pinion shim with one of an alternate thickness.

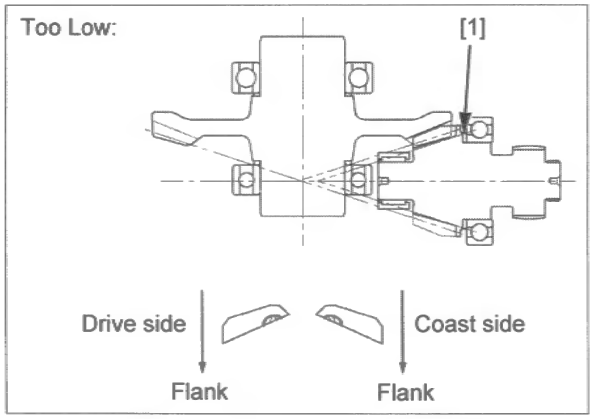


Replace the pinion shim [1] with a thicker one if the contact pattern is too high, toward the face.



Replace the pinion shim [1] with a thinner one if the contact pattern is too low, toward the flank.

The pattern will shift about 0.5 – 1.0 mm (0.02 – 0.04 in) when the thickness of the shim [1] is changed by 0.12 mm (0.005 in).



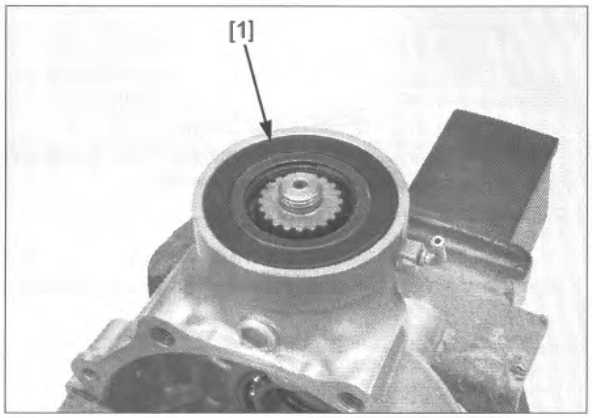
Pinion shims:

A: 1.82 mm (0.072 in)	**E: 2.06 mm (0.081 in)**
B: 1.88 mm (0.074 in)	**F: 2.12 mm (0.083 in)**
C: 1.94 mm (0.076 in)	**G: 2.18 mm (0.086 in)**
D: 2.00 mm (0.079 in) [standard]	**H: 2.24 mm (0.088 in)**
	I: 2.30 mm (0.091 in)

Pinion shim replacement (page 22-25).

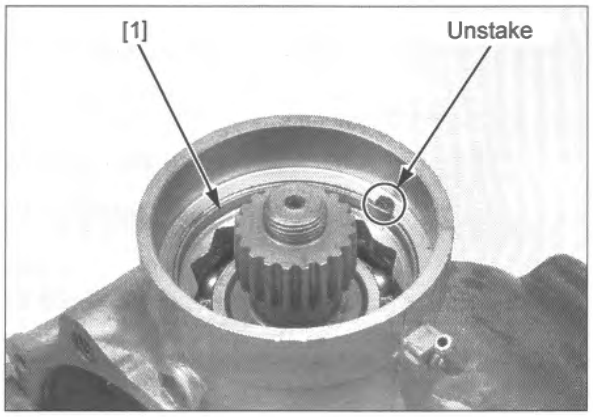
PINION GEAR REMOVAL

Remove the oil seal [1] from the gear case.



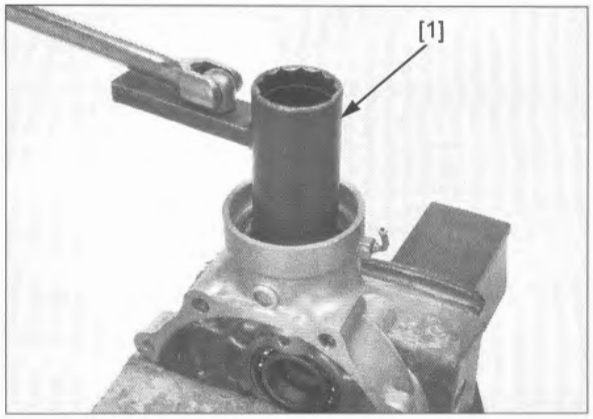
Be careful that metal particles do not enter the bearing and the threads of the case are not damaged.

Unstake the bearing lock nut [1] with a drill or grinder.



Remove the lock nut and discard it.

TOOL:
[1] Locknut Wrench 36 x 47.8 07916-MB00002

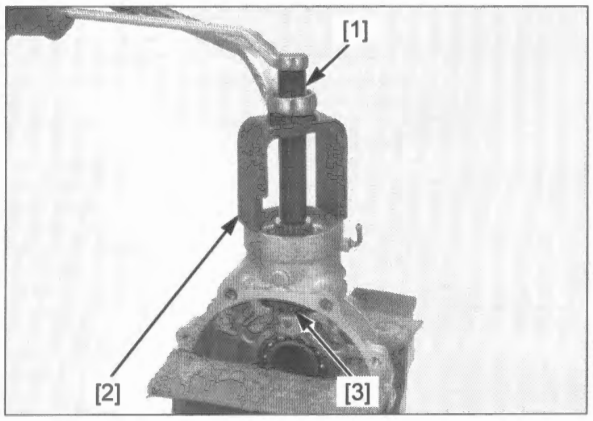


Install the special tools onto the pinion gear and gear case.

TOOLS:
[1] Threaded Shaft 16 x 1.5 x 120L 07931-ME40000
[2] Pinion Puller Base 07HMC-MM80110

U.S.A. TOOLS:
Puller shaft 07931-ME4010B
Special nut 07931-HB3020A
Pinion puller base 07HMC-MM8011A

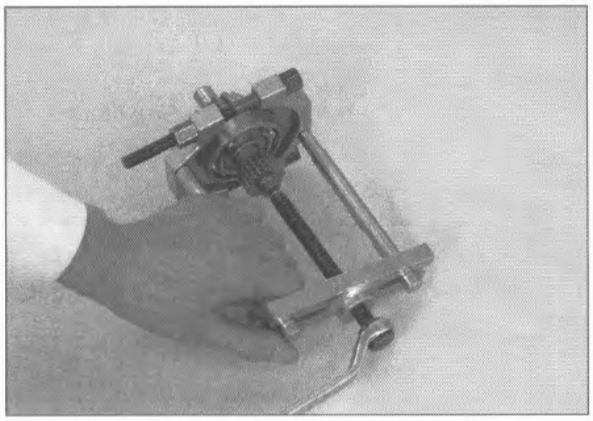
Pull the pinion gear assembly [3] out from the gear case.



PINION BEARING AND SHIM REPLACEMENT

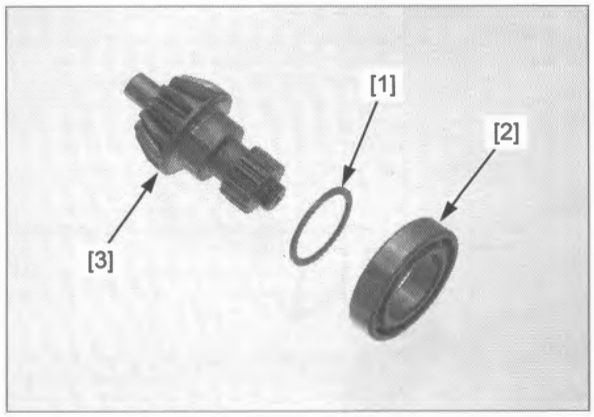
Pull the bearing from the shaft with a commercially available bearing puller.

Remove the bearing and shim.



Install the shim [1] and bearing [2] onto the pinion gear [3].

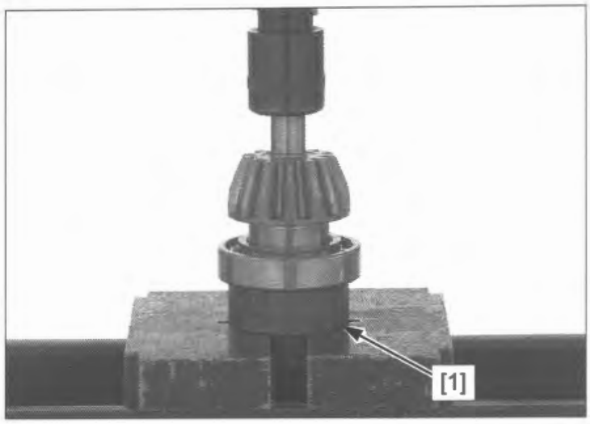
NOTE:
- When the gear set, ring gear bearing, and/or gear case has been replaced, use a 2.00 mm (0.079 in) thick shim for initial reference.



Press the pinion gear into a new bearing until it is fully seated by supporting the bearing inner race.

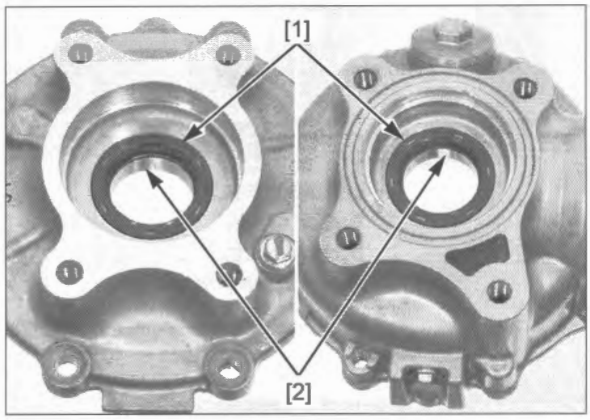
TOOL:

[1] Attachment, 35 mm I.D.	**07746-0030400**



RING GEAR BEARING REPLACEMENT

Remove the oil seals [1] from the gear case and cover. Drive the bearings [2] out of the gear case and cover.



Drive new bearings into the gear case and cover until it is fully seated.

Cover side:

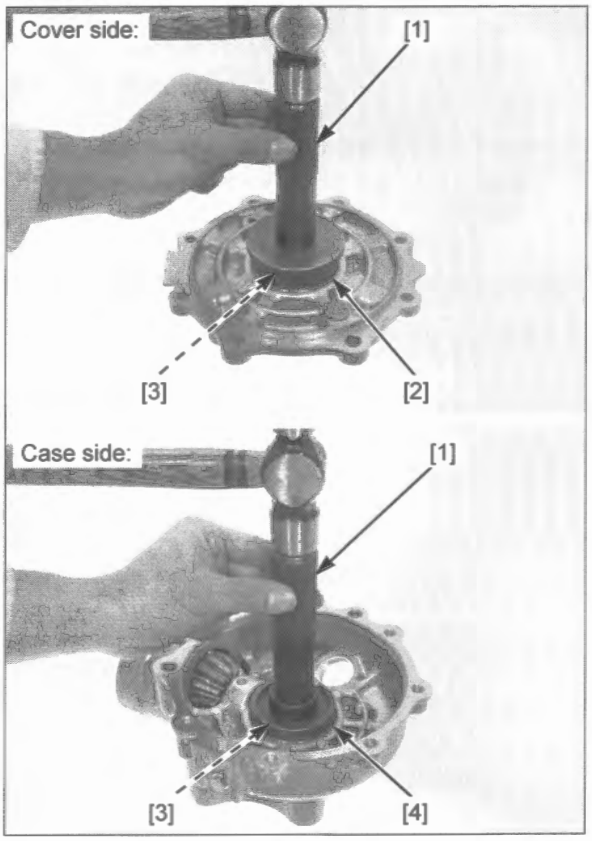
TOOLS:

[1] Driver	**07749-0010000**
[2] Attachment, 62 x 68 mm	**07746-0010500**
[3] Pilot, 35 mm	**07746-0040800**

Case side:

TOOLS:

[1] Driver	**07749-0010000**
[4] Oil seal driver attachment	**07GAD-PG40100**
[3] Pilot, 35 mm	**07746-0040800**

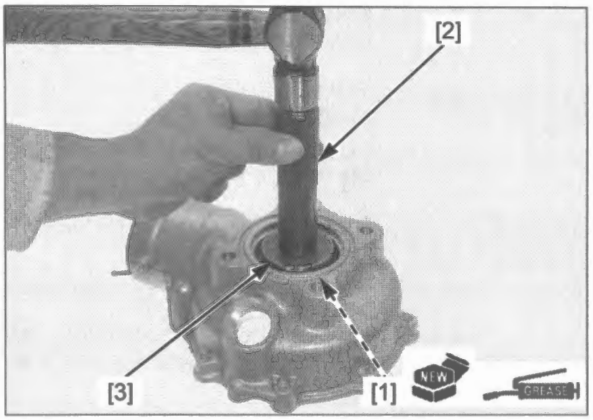


Apply grease to the seal lips of new oil seals.

Install each oil seal [1] with the flat side facing out so that it is flush with the case or cover.

TOOLS:

[2] Driver	**07749-0010000**
[3] Attachment, 52 x 55 mm	**07746-0010400**



PINION NEEDLE BEARING REPLACEMENT

Rotate the stopper ring [1] until its end appears in the access hole [2].
Strike gently near the end of the ring with a punch to bend the end upward.
Grasp the end of the ring with needle-nose pliers and pull the stopper ring out through the access hole.

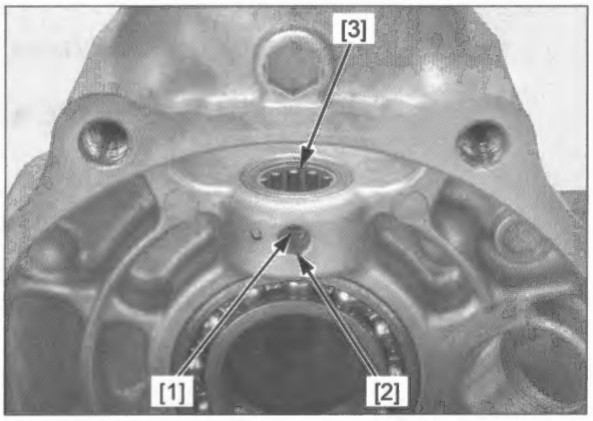
Remove the oil filler cap.

Be sure to wear heavy gloves to avoid burns when handling the heated gear case. Using a torch to heat the gear case may cause warpage.

Heat the gear case to about 80°C (176°F) and remove the needle bearing [3], using the special tools.

TOOLS:

Remover Head, 15 mm	**07936-KC10200**
Remover Shaft, 15 mm	**07936-KC10100**
Remover Weight	**07741-0010201**
U.S.A. TOOLS:	
Bearing remover, 15 mm	**07936-KC10500**
Remover weight	**07936-371020A**



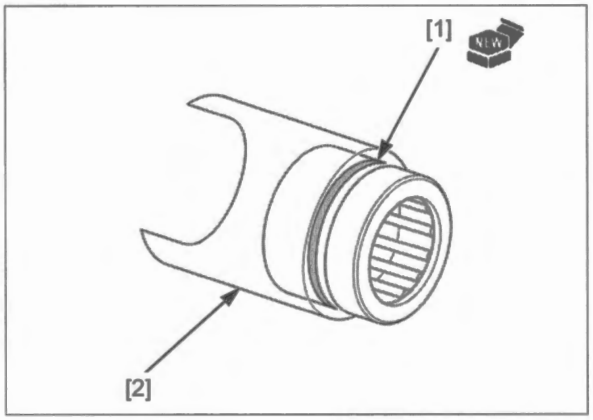
Install a new stopper ring [1] into the groove in a new bearing.

Make sure the stopper ring stays in the groove.

Install the bearing into the compressor [2] until the stopper ring is flush with the end of the tool.

TOOL:

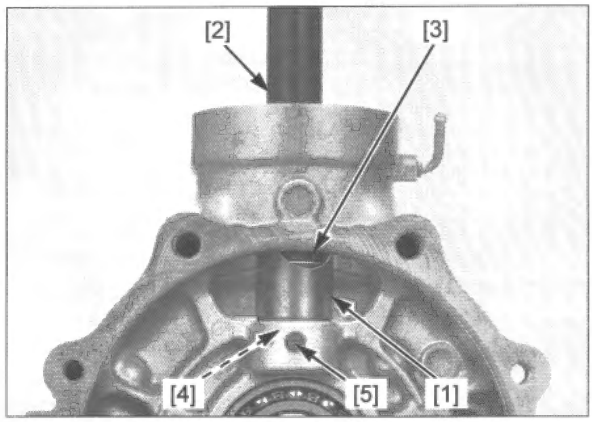
Compressor Diff Bearing Clip 26 mm
070ME-HP50100 or
070ME-HP5A100
(U.S.A. only)



Place the driver, attachment and pilot on the top of the bearing and tape the driver to the compressor [1].

TOOLS:

[2] Driver	**07949-3710001**
[3] Attachment, 24 x 26 mm	**07746-0010700**
[4] Pilot, 15 mm	**07746-0040300**



Place the bearing and tool assembly into a freezer for at least 30 minutes.

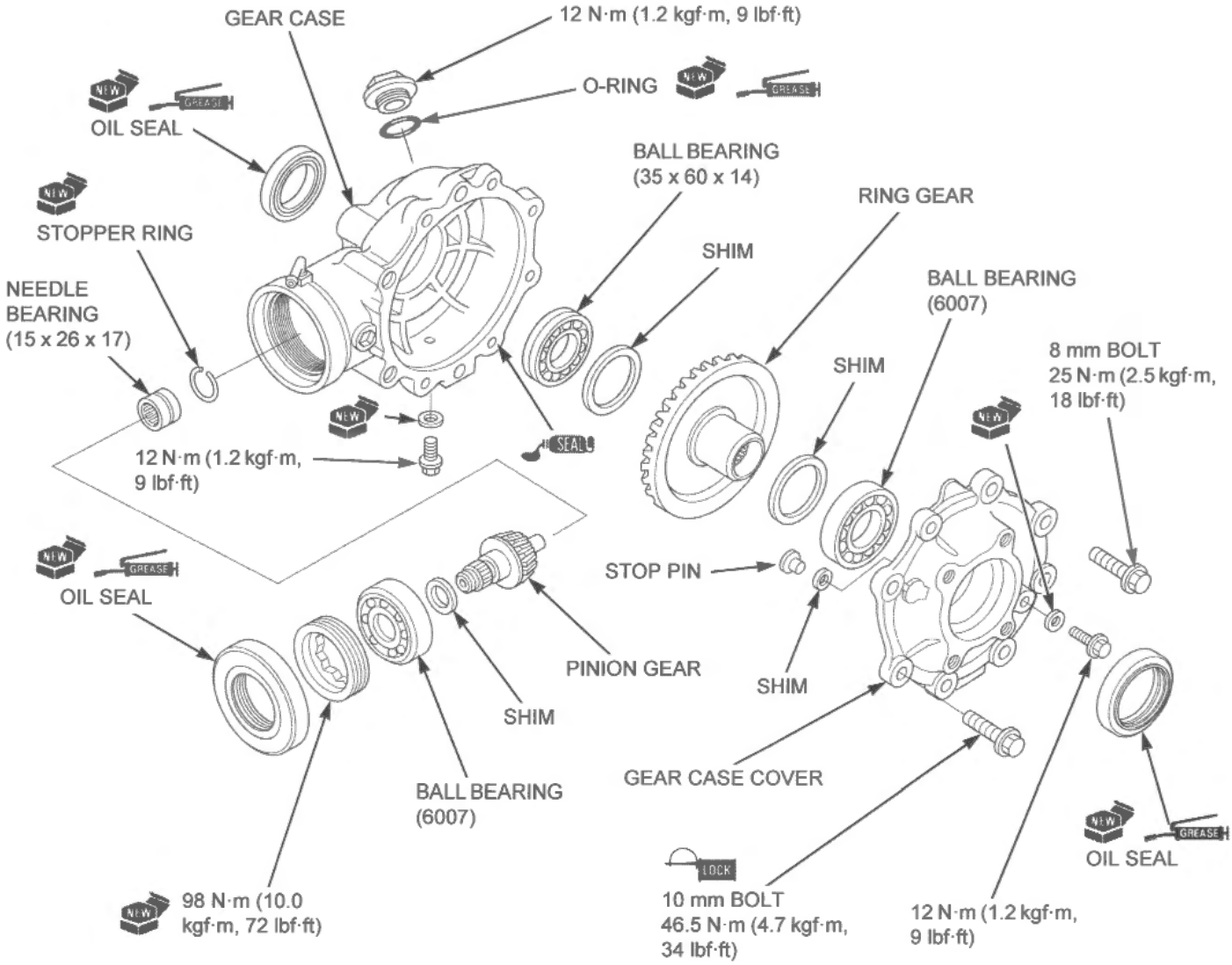
Heat the gear case to 80°C (176°F).

Remove the bearing and tool assembly from the freezer and drive the bearing into the gear case using the special tools.

Only strike the driver once. If you strike it more than once, the stopper ring [5] may slip out of the groove. If this happens, remove the ring and bearing, and install a new ring.

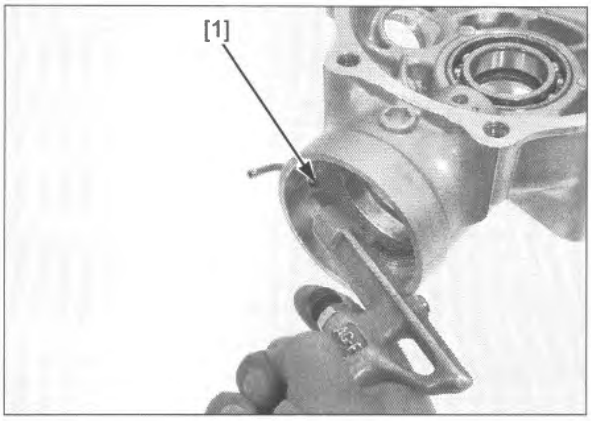
Make sure the stopper ring is securely set in the groove of the gear case.

REAR FINAL GEAR CASE ASSEMBLY



PINION GEAR INSTALLATION

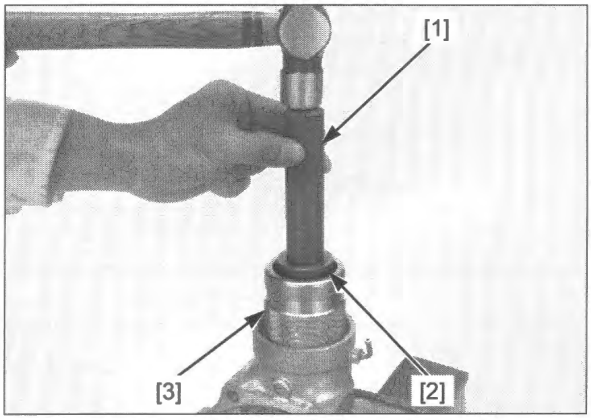
Blow compressed air through the breather hole [1] in the gear case.



Drive the pinion gear assembly into the gear case until it is fully seated.

TOOLS:

[1] Driver	**07749-0010000**
[2] Attachment, 42 x 47 mm	**07746-0010300**
[3] Fork Seal Driver Weight	**07747-0010100**
	07AAF-S3VA101 (U.S.A. only)



Install a new lock nut [1] and tighten it to the specified torque.

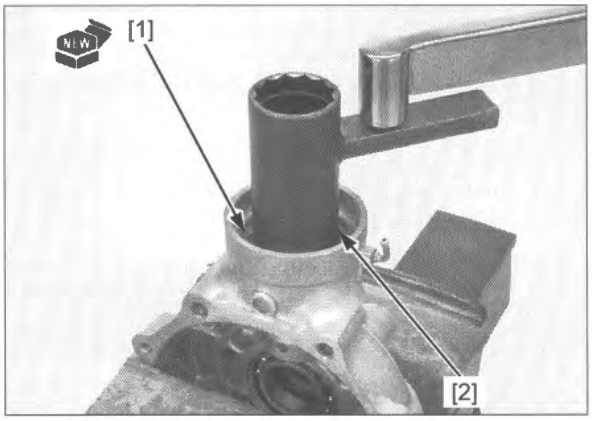
TOOL:

[2] Locknut Wrench 36 x 47.8 07916-MB00002

Refer to "Service Information" for torque wrench reading information (page 22-2).

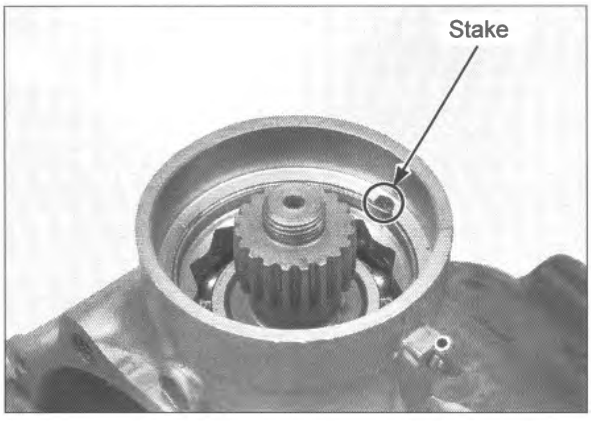
TORQUE:

Actual: 98 N·m (10.0 kgf·m, 72 lbf·ft)
Indicated: 89 N·m (9.1 kgf·m, 66 lbf·ft)

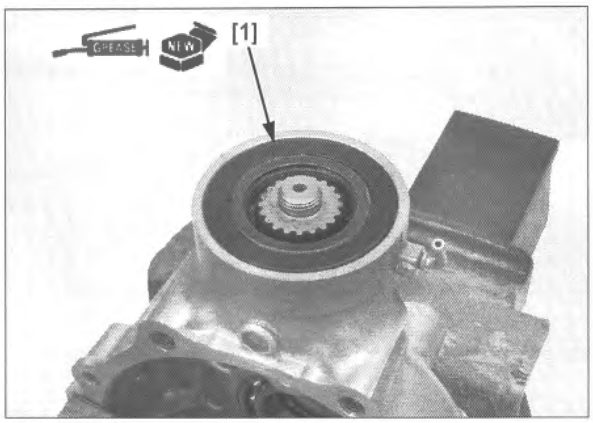


Be careful not to damage the threads of the case.

Stake the lock nut into the case groove.



Apply grease to the lips of a new oil seal [1] and install it so that it is flush with the gear case.



RING GEAR CLEARANCE INSPECTION

Install the ring gear [1] with the left shim into the case cover [2].

Measure the clearance between the ring gear and stop pin [3] with a feeler gauge.

CLEARANCE: 0.3 – 0.6 mm (0.01 – 0.02 in)

Remove the ring gear.

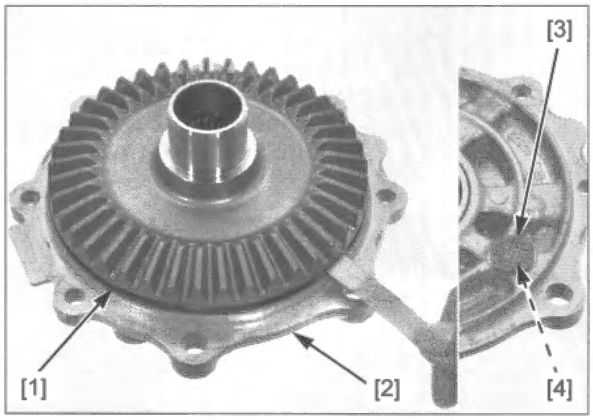
Be sure to wear heavy gloves to avoid burns when handling the heated case cover. Using a torch to heat the cover may cause warpage.

If the clearance exceeds the standard value, heat the case cover to approximately 80°C (176°F) and remove the stop pin by tapping the cover.

Install a stop pin shim [4] to obtain the correct clearance.

Stop pin shims: A: 0.10 mm (0.004 in)
B: 0.15 mm (0.006 in)

Install the shim and drive the stop pin into the case cover.



FINAL GEAR CASE ASSEMBLY

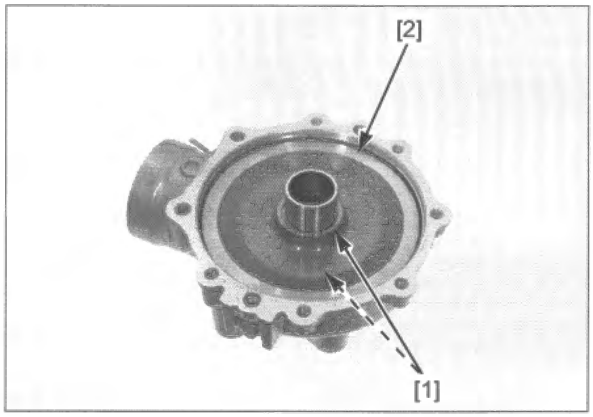
NOTE:

- When the gear set, bearing, and/or gear case has been replaced, check the following:
  – tooth contact pattern (page 22-23)
  – gear backlash (page 22-21)

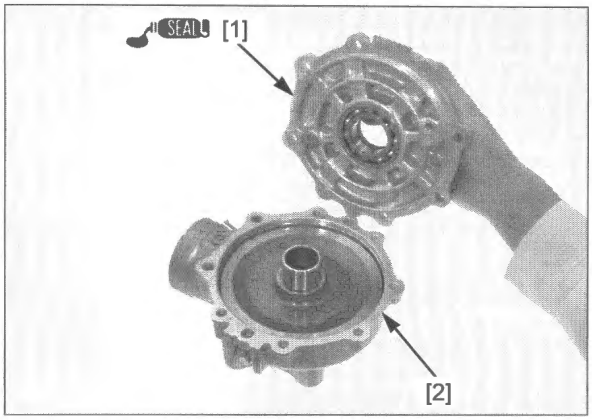
Keep dust and dirt out of the case and cover.

Clean the mating surface of the gear case and cover, being careful not to damage them.

Install the proper ring gear shims [1] onto the ring gear [2] and install them into the gear case.



Apply liquid sealant (TB1215 or equivalent) to the mating surface of the case cover [1].
Install the cover onto the gear case [2].

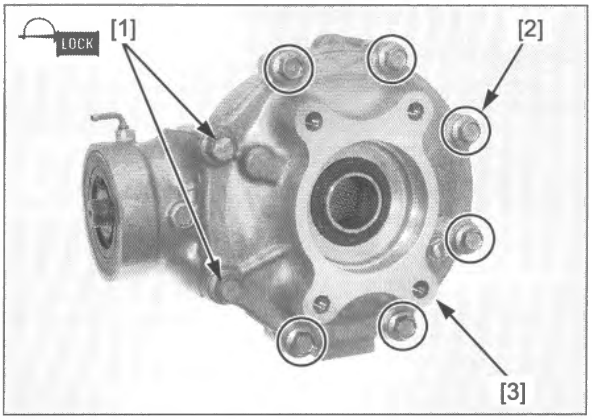


It is important to turn the pinion while tightening the bolts. If the ring gear shim is too thick, the gears will lock after only light tightening.

Apply locking agent to the threads of the two 10 mm bolts [1].
Install the two 10 mm bolts and six 8 mm bolts [2], and tighten them several steps until the cover [3] evenly touches the case. Then, while rotating the pinion gear, tighten the bolts to the specified torque in a crisscross pattern in several steps.

TORQUE:
10 mm bolt: 46.5 N·m (4.7 kgf·m, 34 lbf·ft)
8 mm bolt: 25 N·m (2.5 kgf·m, 18 lbf·ft)

Make sure that the gear assembly rotates smoothly without binding.



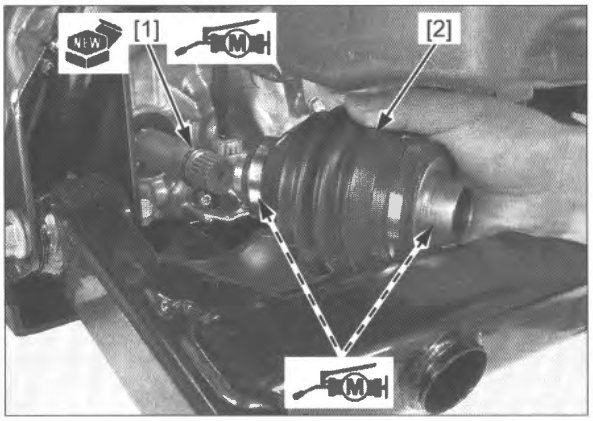
INSTALLATION

Coat a new O-ring [1] with molybdenum disulfide grease and install it into the groove in the output shaft.

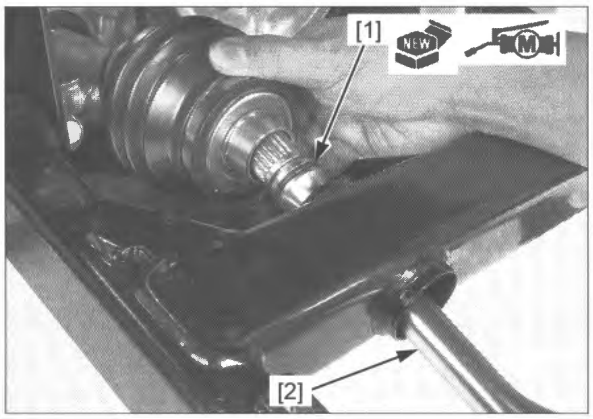
Apply molybdenum disulfide grease to the splines of both sides in the universal joint [2].

Install with the small O.D. side facing the engine.

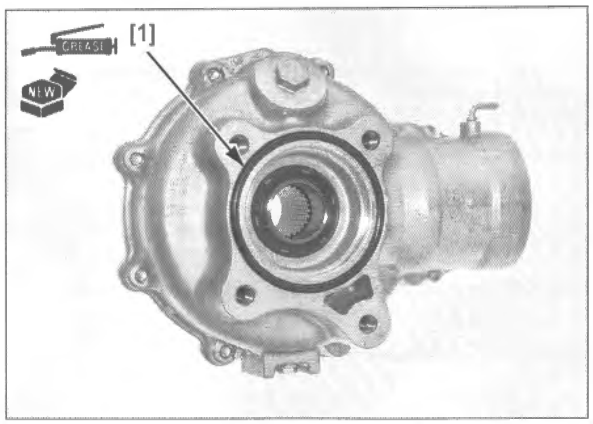
Install the universal joint onto the output shaft until it is fully seated.



Coat a new O-ring [1] with molybdenum disulfide grease and install it into the groove in the propeller shaft [2].
Install the propeller shaft into the universal joint until it is fully seated.



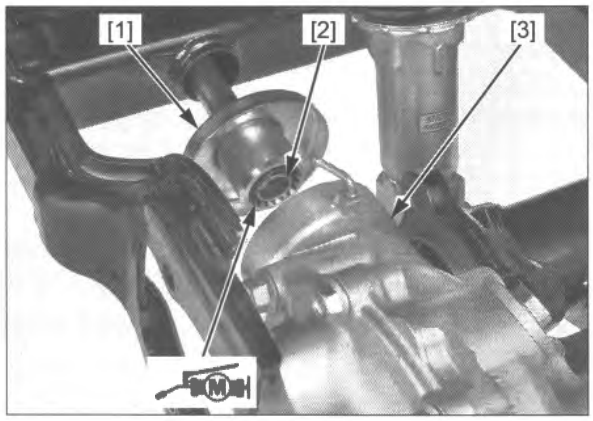
Coat a new O-ring [1] with grease and install it into the gear case groove.



Apply molybdenum disulfide grease to the splines of the propeller shaft [1].

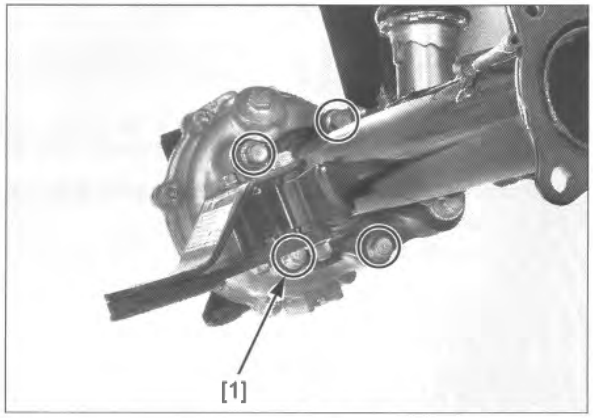
Install the joint spring [2] into the propeller shaft firmly.

Install the gear case assembly [3] onto the propeller shaft by aligning the splines, and onto the swingarm.



Install the four mounting bolts [1] and tighten them to the specified torque.

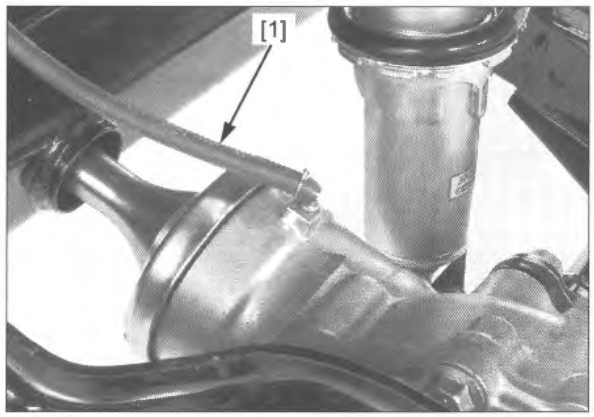
TORQUE: 74 N·m (7.5 kgf·m, 55 lbf·ft)



Connect the breather hose [1] to the final gear case.

Install the following:

- rear axle (page 22-10)
- skid plate (page 2-16)



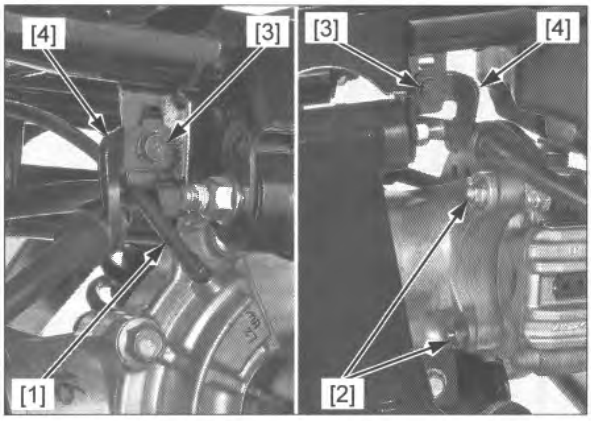
REAR FINAL DRIVE (FM5/FM6/FM7/ FA5/FA6/FA7)

REMOVAL

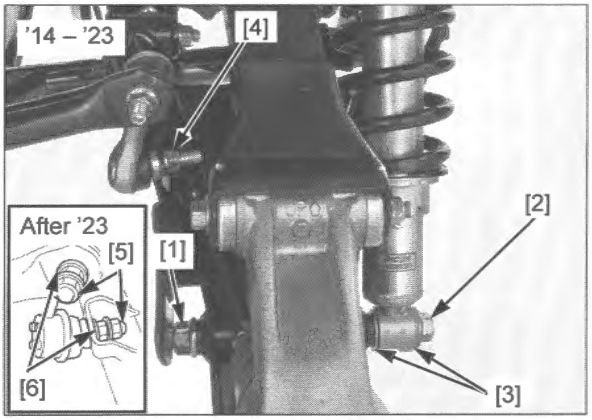
Drain the rear final drive oil (page 3-19).

Remove the following:

- rear wheels (page 19-6)
- right rear drive shaft (page 22-12)
- right rear lower arm (page 19-13)
- air cleaner sub chamber (page 7-18)
- breather hose [1]
- rear brake caliper mounting bolts [2]
- bolts [3] and brake hose clamps [4]

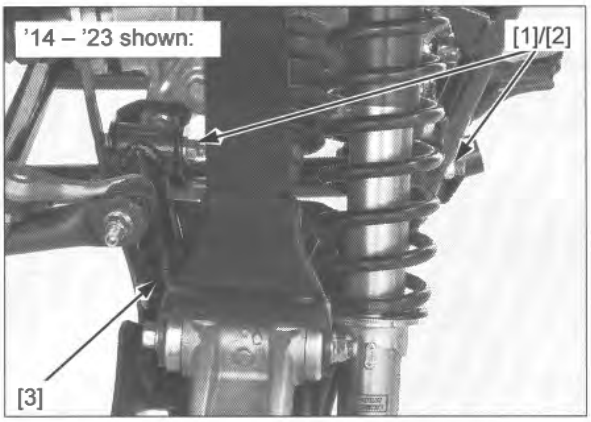


- left rear shock absorber lower mounting nut [1], bolt [2] and washers [3]
- left stabilizer link nut [4] ('14 - '23)
- left stabilizer link cap nut [5] (after '23)
- left stabilizer link flange nut [6] (after '23)

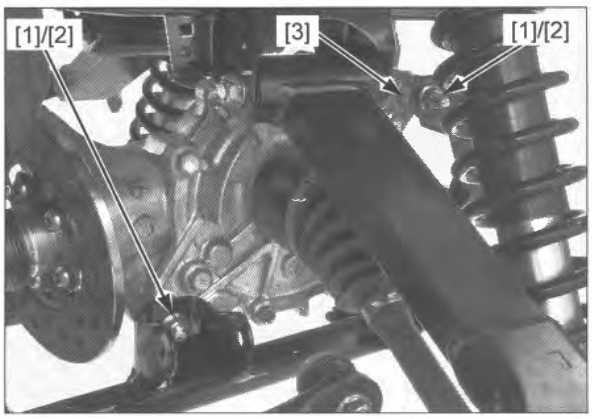


- left lower arm pivot nuts [1] and bolts [2]

Release the lower arm [3] from the frame.

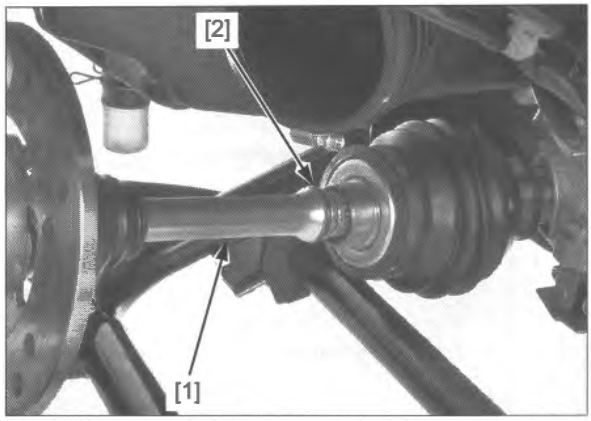


Support the gear case with wooden blocks to relieve stress for ease of bolt removal, and remove the gear case mounting nuts [1], bolts [2] and collar [3].



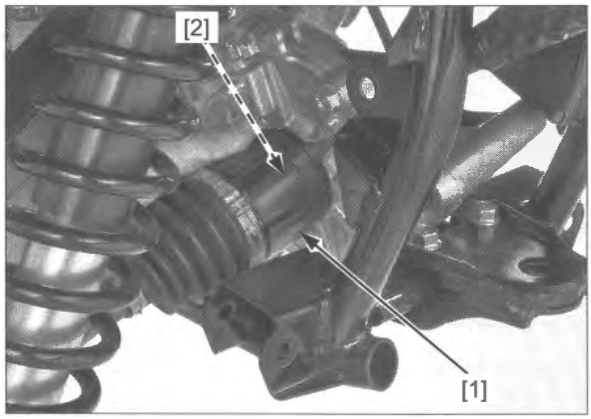
Release the gear case assembly from the mounting points by pulling it rearward and disconnect the propeller shaft [1] from the universal joint.

Remove the O-ring [2] from the propeller shaft.

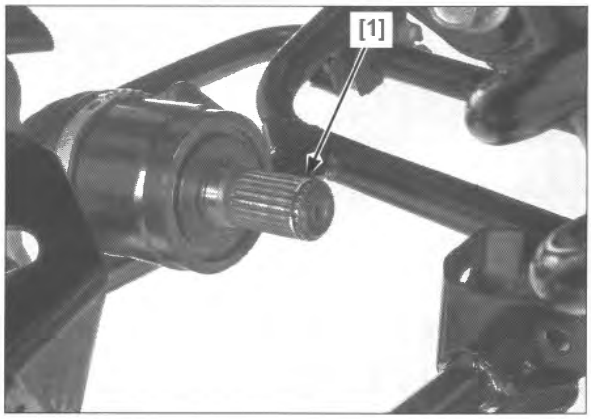


Hold the inboard joint [1] of the left rear drive shaft and tug firmly to force the stopper ring [2] on the inboard joint end past the groove while prying with a screwdriver.

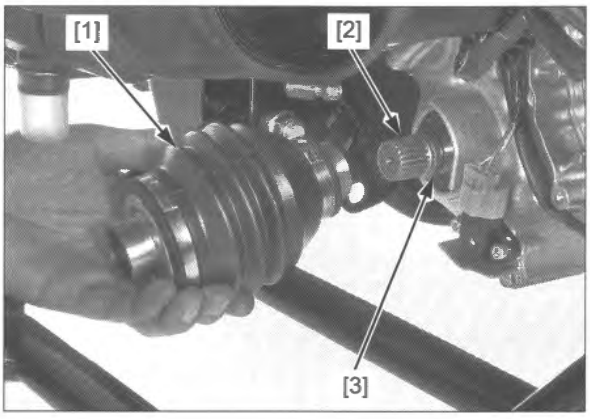
Remove the gear case assembly from the right side.



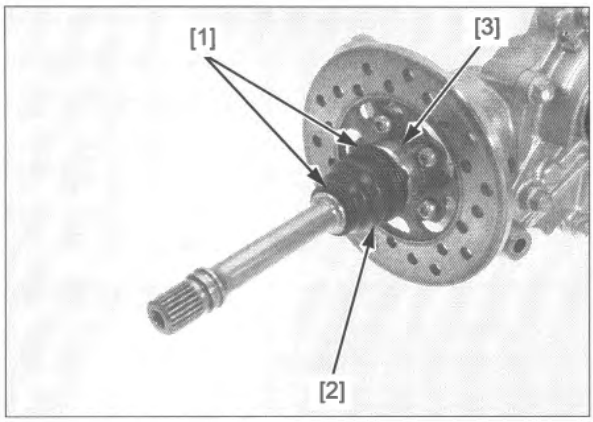
Remove the stopper ring [1] from the inboard joint.



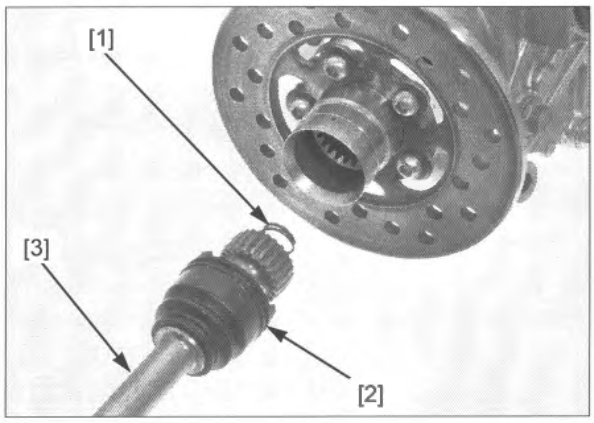
Disconnect the universal joint [1] from the engine output shaft [2] and remove the O-ring [3].



Remove the boot bands [1] and release the propeller shaft boot [2] off the pinion joint [3] of the gear case.



Remove the spring [1] and boot [2] from the propeller shaft [3].



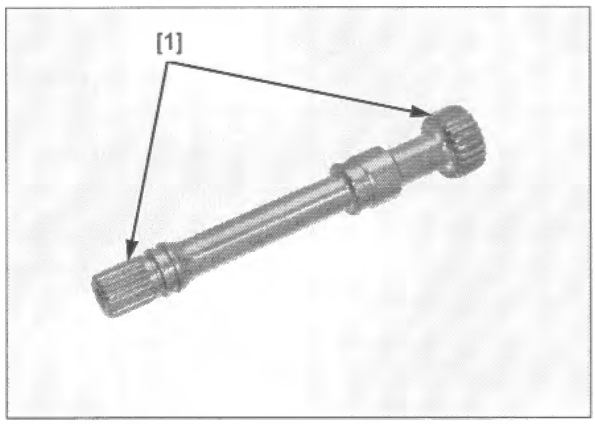
INSPECTION

UNIVERSAL JOINT

For universal joint inspection and service (page 22-21).

PROPELLER SHAFT

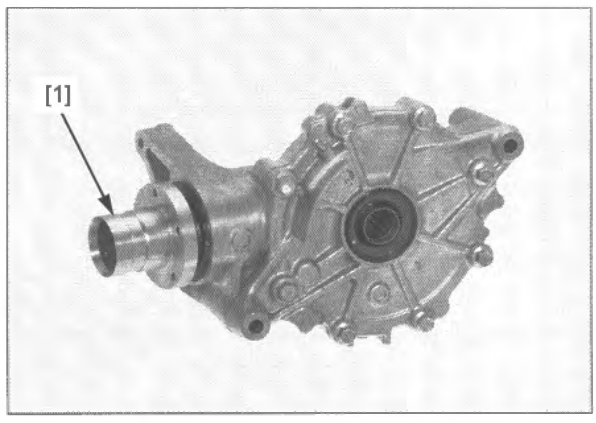
Check the splines [1] of the propeller shaft for wear or damage.
If they are damaged, check the pinion and universal joint splines also.



OPERATION CHECK

Turn the pinion joint [1] and check that the gear turns smoothly and quietly without binding.

If the gears do not turn smoothly or quietly, the gears and/or bearing may be damaged or faulty.
They must be checked after disassembly; replace them if necessary.



BACKLASH INSPECTION

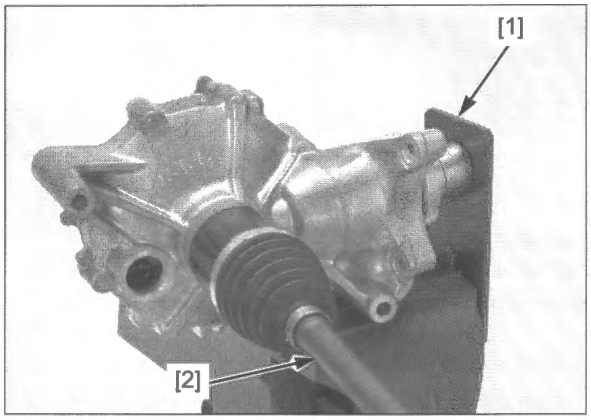
Remove the rear brake disc (page 22-37).

Remove the oil filler cap.

Install the special tool into the pinion joint, and set the final drive assembly and tool in a vise.

TOOL:
[1] Pinion holder 07SMB-HM70200

Install the drive shaft [2] into the final drive assembly and hold it.

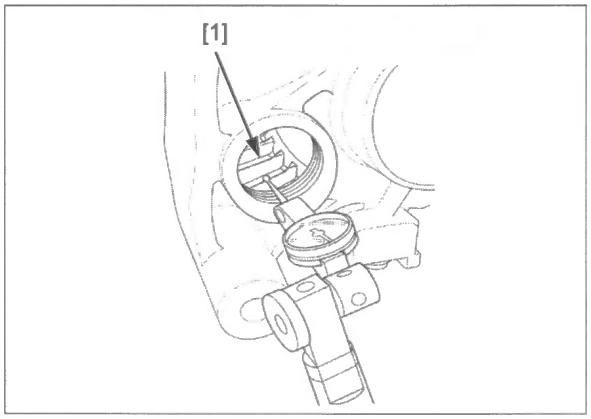


Set a horizontal type dial indicator on the ring gear [1] through the filler hole.
Turn the ring gear back and forth with the drive shaft to read backlash.

STANDARD: 0.05 – 0.25 mm (0.002 – 0.010 in)
SERVICE LIMIT: 0.4 mm (0.02 in)

Remove the dial indicator. Turn the ring gear 120° and measure backlash.
Repeat this procedure once more.
Compare the difference of the three measurements.

SERVICE LIMIT: 0.2 mm (0.01 in)

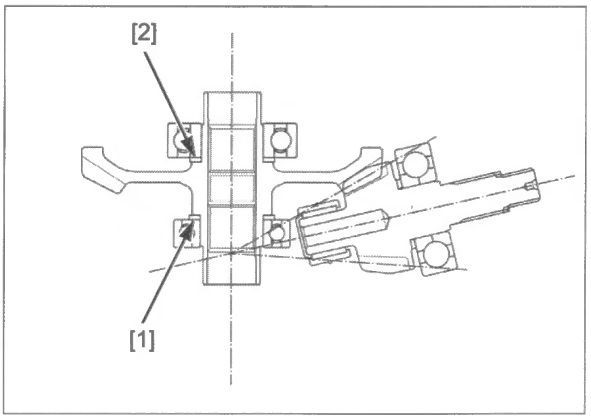


If the difference in measurements exceeds the service limit, it indicates that the bearing is not installed squarely, or the case is deformed.
Inspect the bearings and case.

If the backlash is excessive, replace the ring gear right shim [1] with a thinner one.
If the backlash is too small, replace the ring gear right shim with a thicker one.
Backlash is changed by about 0.05 mm (0.002 in) when thickness of the shim is changed by 0.10 mm (0.004 in).

NOTE:

- Twenty-three different shims (from A to W) are available in thickness increments of 0.05 mm (0.002 in).



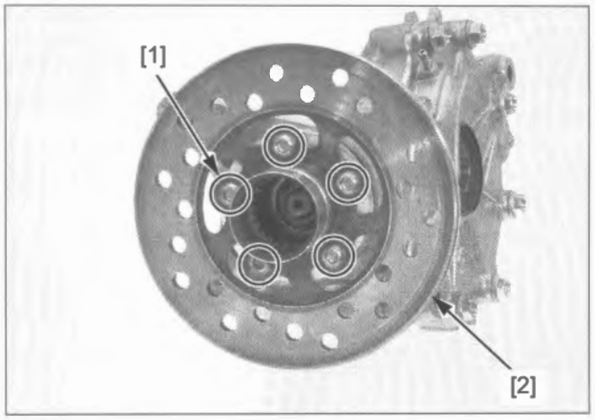
Right ring gear shims:

A: 0.50 mm (0.020 in)	**M: 1.10 mm (0.043 in)**
B: 0.55 mm (0.022 in)	**N: 1.15 mm (0.045 in)**
C: 0.60 mm (0.024 in)	**O: 1.20 mm (0.047 in)**
D: 0.65 mm (0.026 in)	**P: 1.25 mm (0.049 in)**
E: 0.70 mm (0.028 in)	**Q: 1.30 mm (0.051 in)**
F: 0.75 mm (0.030 in)	**R: 1.35 mm (0.053 in)**
G: 0.80 mm (0.031 in)	**S: 1.40 mm (0.055 in)**
H: 0.85 mm (0.033 in)	**T: 1.45 mm (0.057 in)**
I: 0.90 mm (0.035 in)	**U: 1.50 mm (0.059 in)**
J: 0.95 mm (0.037 in)	**V: 1.55 mm (0.061 in)**
K: 1.00 mm (0.039 in)	**W: 1.60 mm (0.063 in)**
L: 1.05 mm (0.041 in)	

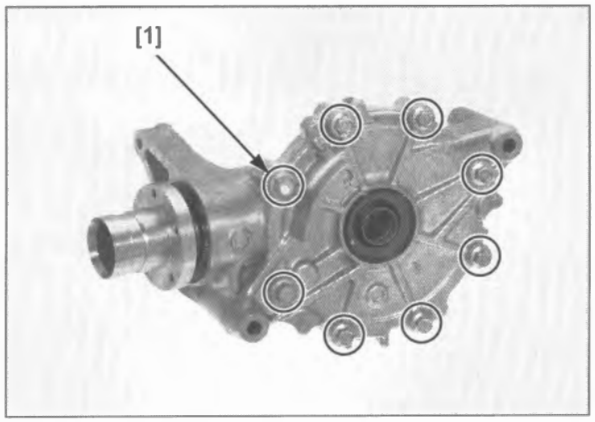
Change the left shim [2] thickness in an opposite amount of what the right shim was changed; If the right shim was replaced with a 0.10 mm (0.004 in) thicker one, replace the left shim with a 0.10 mm (0.004 in) thinner one.

FINAL GEAR CASE DISASSEMBLY

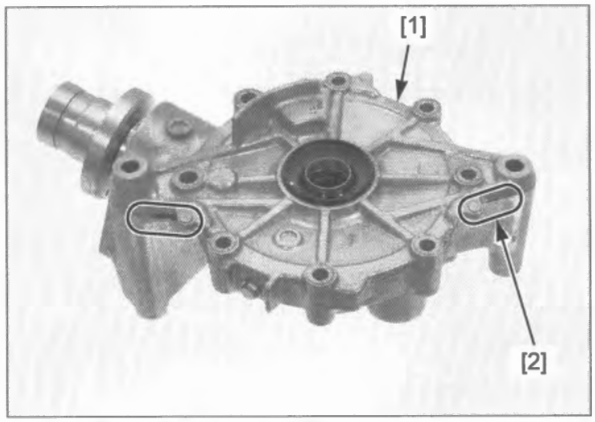
Remove the bolts [1] and rear brake disc [2].



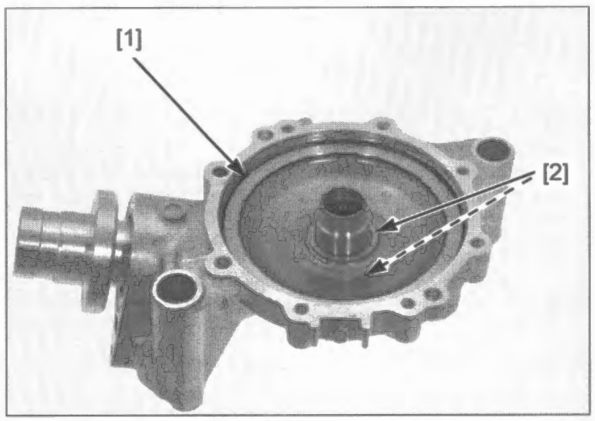
Loosen the cover bolts [1] in a crisscross pattern in several steps and remove them.



Pry the case cover [1] at the prying points [2] using a screwdriver and remove the case cover.



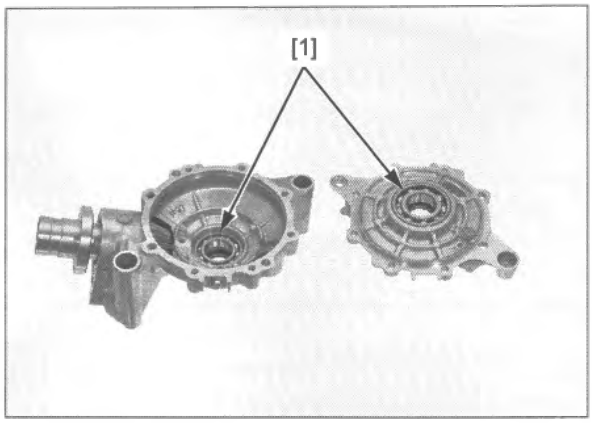
Remove the ring gear [1] and shims [2].



BEARING INSPECTION

Turn the inner race of each bearing [1] in the gear case and case cover with your finger. The bearings should turn smoothly and quietly. Also check that the bearing outer race fits tightly in the case and cover.

For ring gear bearing replacement (page 22-41).



GEAR TOOTH CONTACT PATTERN CHECK

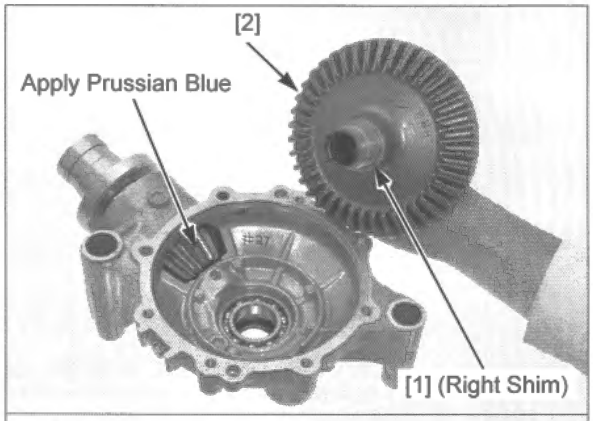
Keep dust and dirt out of the case and cover.

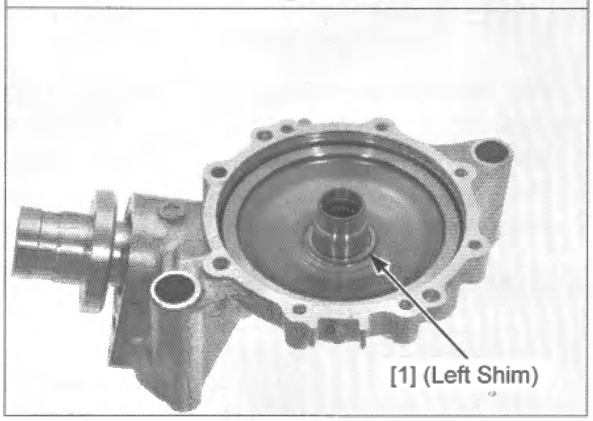
Clean the mating surfaces of the gear case and cover.

Apply a thin coat of Prussian Blue to the pinion gear teeth for a tooth contact pattern check.

Install the ring gear shims [1] onto the ring gear [2].

Install the ring gear with the shims into the gear case.





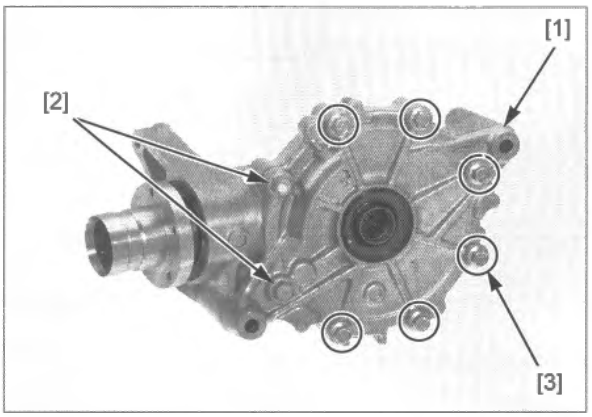
Align the bolt holes and install the case cover [1].

It is important to turn the pinion while tightening the bolts. If the ring gear shims is too thick, the gears will lock after only light tightening.

Install the cover bolts and tighten them in several steps until the cover evenly touches the gear case. Then, while rotating the pinion gear, tighten the bolts to the specified torque in a crisscross pattern in several steps.

TORQUE:

10 mm bolt [2]: 46.5 N·m (4.7 kgf·m, 34 lbf·ft)
8 mm bolt [3]: 25 N·m (2.5 kgf·m, 18 lbf·ft)

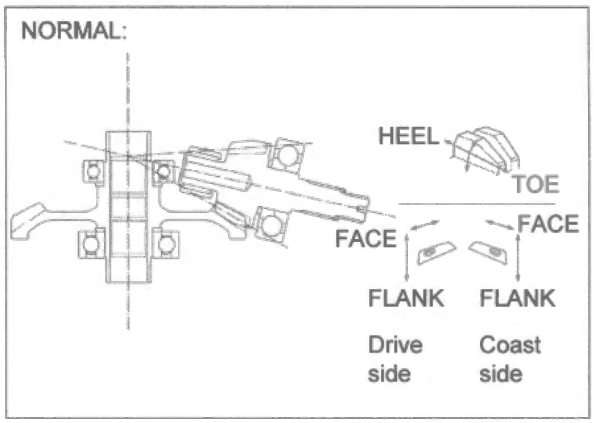


Remove the oil filler cap.

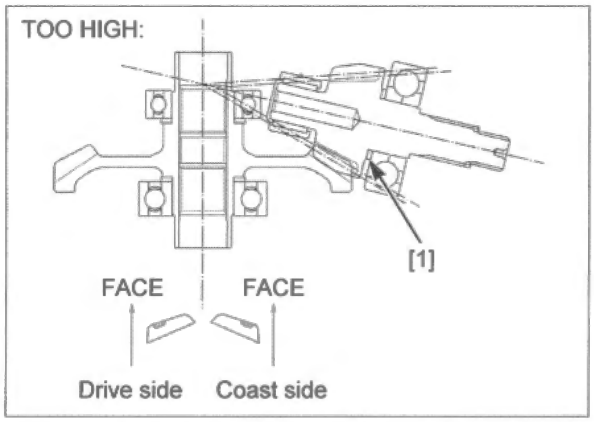
Rotate the ring gear several times in both directions of rotation.

Check the gear tooth contact pattern through the oil filler hole.
The pattern is indicated by the Prussian Blue applied to the pinion.
Contact is normal if the Prussian Blue is transferred to the approximate center of each tooth, but slightly to the heel side and to the flank side.

If the pattern are not correct, remove and change the pinion shim with one of an alternate thickness.



Replace the pinion shim [1] with a thicker one if the contact pattern is too high, toward the face.

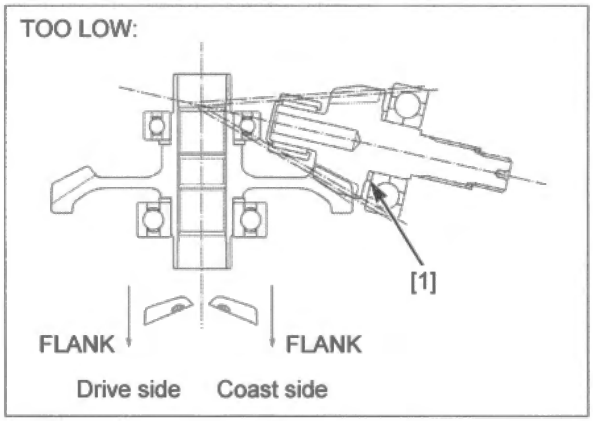


Replace the pinion shim [1] with a thinner one if the contact pattern is too low, toward the flank.

The pattern will shift about 0.5 – 1.0 mm (0.02 – 0.04 in) when the thickness of the shim is changed by 0.12 mm (0.005 in).

Pinion gear shims:

A: 1.32 mm (0.052 in)	**F: 1.62 mm (0.064 in)**
B: 1.38 mm (0.054 in)	**G: 1.68 mm (0.066 in)**
C: 1.44 mm (0.057 in)	
D: 1.50 mm (0.059 in)	
E: 1.56 mm (0.061 in)	



For pinion shim replacement (page 22-41).

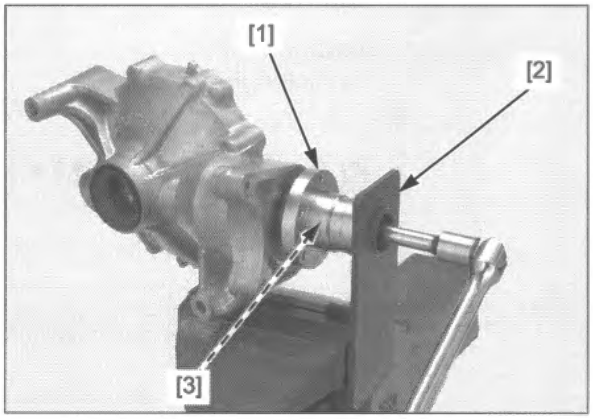
PINION GEAR REMOVAL

Install the special tool into the pinion joint [1], and set the final drive assembly and tool in a vise.

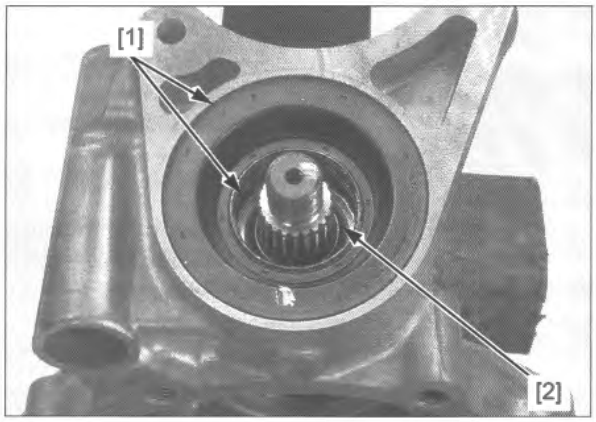
TOOL:
[2] Pinion holder **07SMB-HM70200**

Take care not to drop the final drive assembly from the vise.

Loosen the pinion joint nut [3], and remove the joint nut and pinion joint.

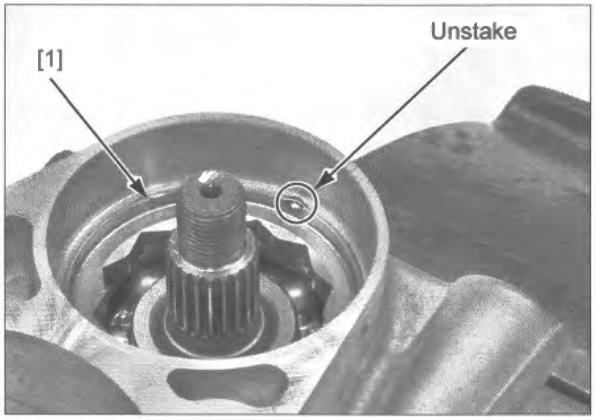


Remove the oil seals [1] and O-ring [2].



Be careful that metal particles do not enter the bearing and the threads of the case are not damaged.

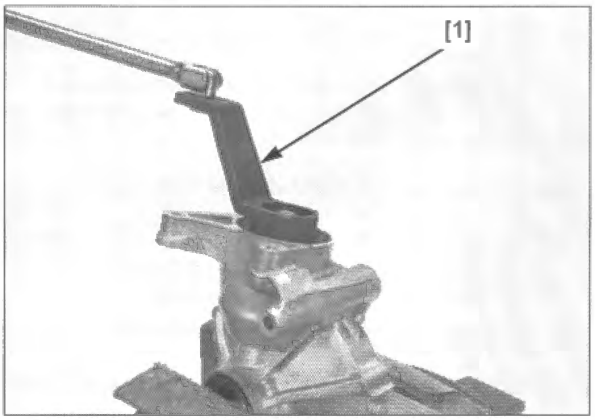
Unstake the pinion bearing lock nut [1] with a drill or grinder.



Remove the lock nut using the special tool.

TOOL:

[1] Holding tool Snap-on YA6010A or equivalent

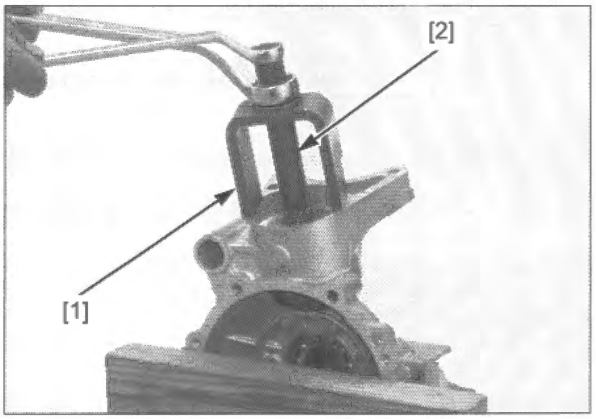


Install the special tools onto the pinion gear shaft and gear case.

TOOLS:

[1] Pinion puller base	**07HMC-MM80110 or 07HMC-MM8011A (U.S.A. only)**
[2] Threaded shaft, 16 x 1.5 x 120L	**07931-ME40000 or 07931-ME4010B and 07931-HB3020A (U.S.A. only)**

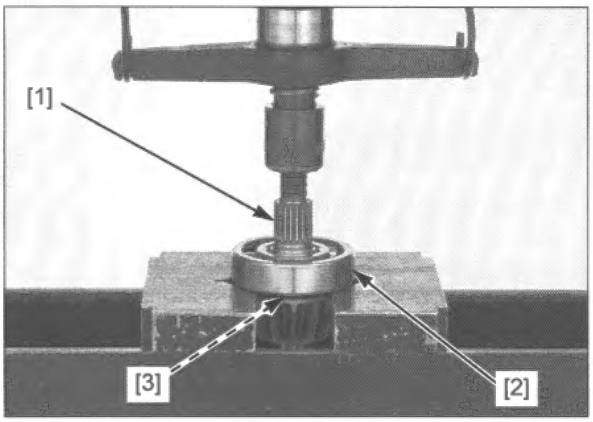
Pull the pinion gear assembly out from the gear case.



PINION GEAR BEARING/SHIM REPLACEMENT

Press the pinion gear [1] out of the pinion bearing [2] using a hydraulic press.

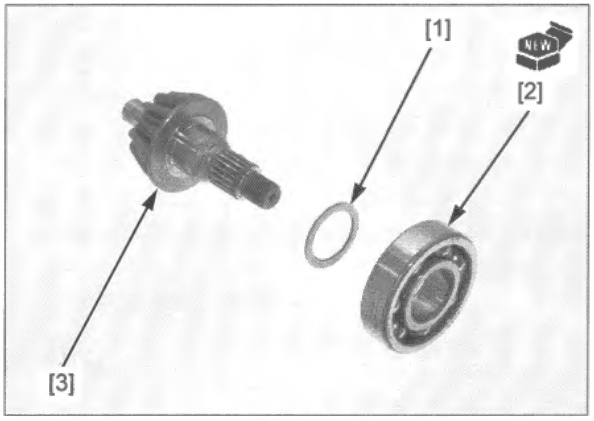
Remove the pinion shim [3].



Install the shim [1] and a new bearing [2] onto the pinion gear [3].

NOTE:

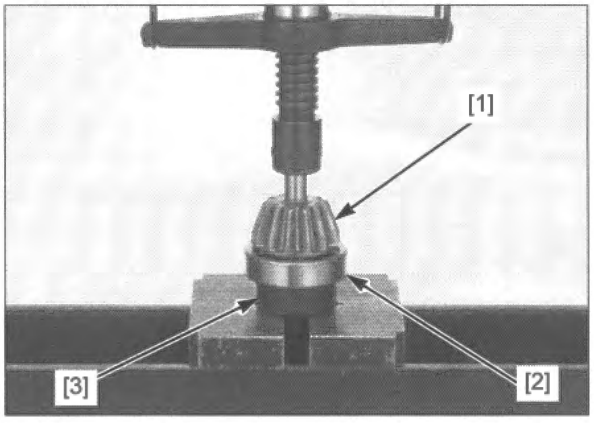
- When the gear set, ring gear bearing, and/or gear case has been replaced, use a 1.50 mm (0.059 in) thick shim for initial reference.



Press the pinion gear [1] until it is seated by supporting the inner race of the bearing [2] with the special tool.

TOOL:

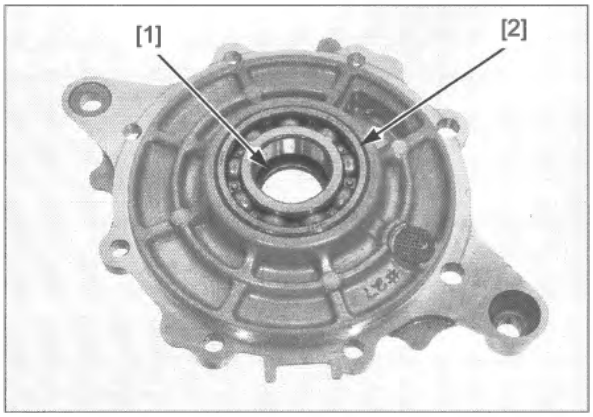
[3] Attachment, 30 mm 07746-0030300



RING GEAR BEARING REPLACEMENT

Remove the oil seals [1] from the case and cover.

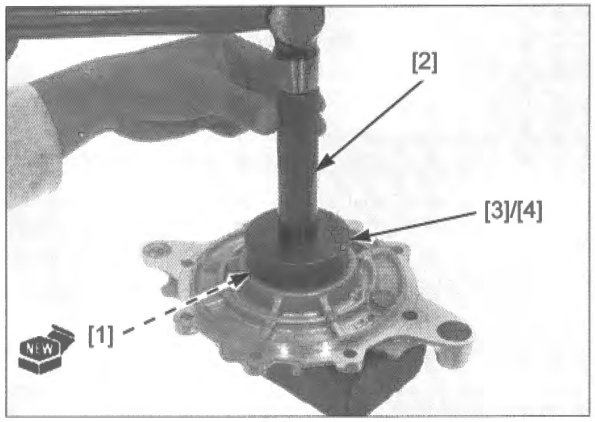
Drive the bearings [2] out of the case and cover.



Drive each new bearing [1] using the special tools.

TOOLS:

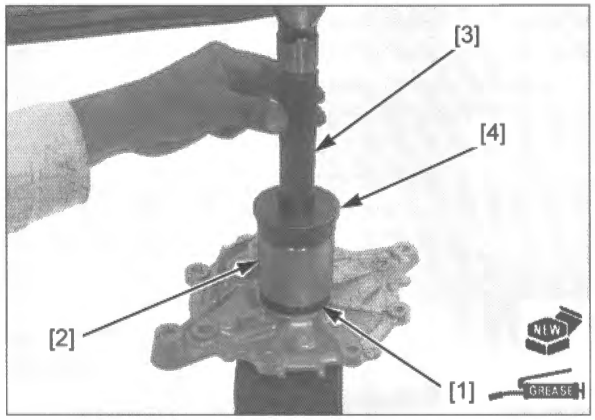
Case cover:	
[2] Driver	**07749-0010000**
[3] Attachment, 62 x 68 mm	**07746-0010500**
[4] Pilot, 35 mm	**07746-0040800**
Gear case:	
Driver	**07749-0010000**
Attachment, 62 x 68 mm	**07746-0010500**
Pilot, 35 mm	**07746-0040800**



Apply grease to new oil seal [1] lips.
Install each oil seal with the metal side facing out until it is fully seated.

TOOLS:

[2] Fork seal driver, 39.2 mm	**07947-4630100**
[3] Driver	**07749-0010000**
[4] Attachment, 62 x 68 mm	**07746-0010500**



PINION NEEDLE BEARING REPLACEMENT

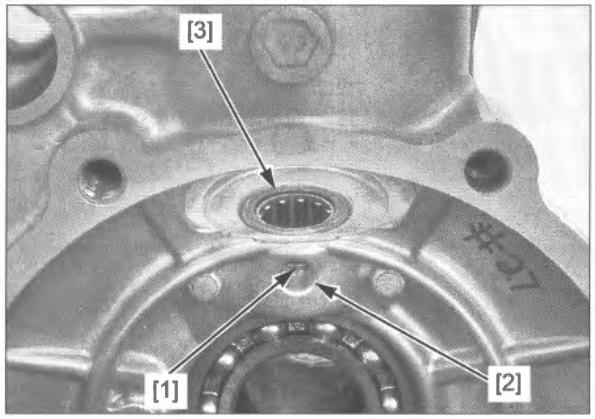
Remove the stopper ring [1] by rotating it until the end of the stopper ring appears in the access hole [2].
Strike gently near the end of the ring with a punch to bend the end upward.
Grasp the end of the ring with needle-nosed pliers and pull the stopper ring out through the access hole.

Be sure to wear heavy gloves to avoid burns when handling the heated gear case. Using a torch to heat the gear case may cause warpage.

Heat the gear case to 80°C (176°F) and remove the needle bearing [3] by using the special tool.

TOOLS:

Remover head, 15 mm	**07936-KC10200**
Remover shaft, 15 mm	**07936-KC10100 or**
Bearing remover, 15 mm	**07936-KC10500 (U.S.A. only)**
Remover weight	**07741-0010201 or 07936-371020A (U.S.A. only)**

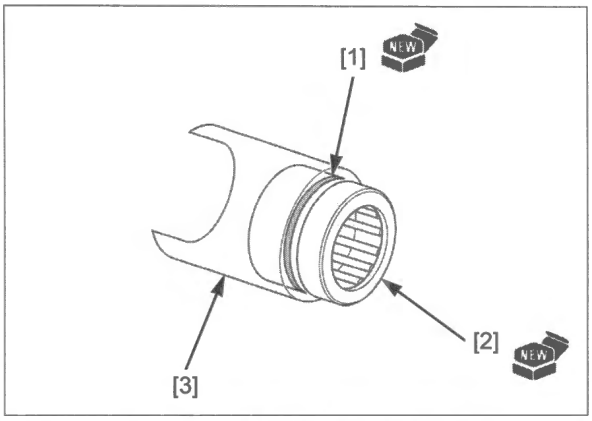


Remove the bearing cage and bearings from the inside of the pinion bearing to allow the special tool to grip the bearing.

Install a new stopper ring [1] into the groove in a new bearing [2].
Install the bearing into the special tool until the stopper ring is flush with the end of the tool.

TOOL:
[3] Compressor Diff Bearing 070ME-HP50100
Clip, 26 mm

Freeze the pinion bearing in a freezer.
Heat the gear case to 80°C (176°F).



Tape the clip compressor [1] to the driver for bearing installation.

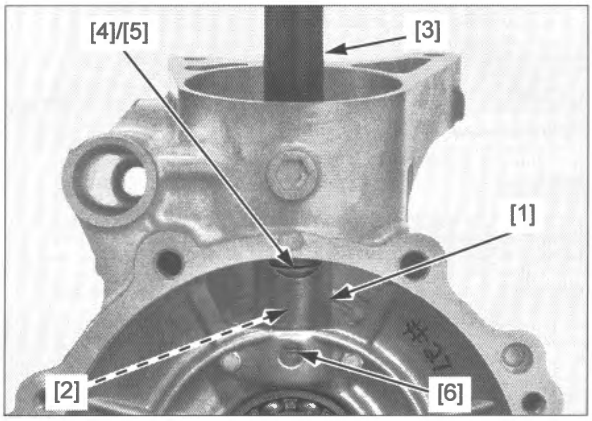
Drive the pinion bearing [2] into the gear case using the special tools as follows.

TOOLS:

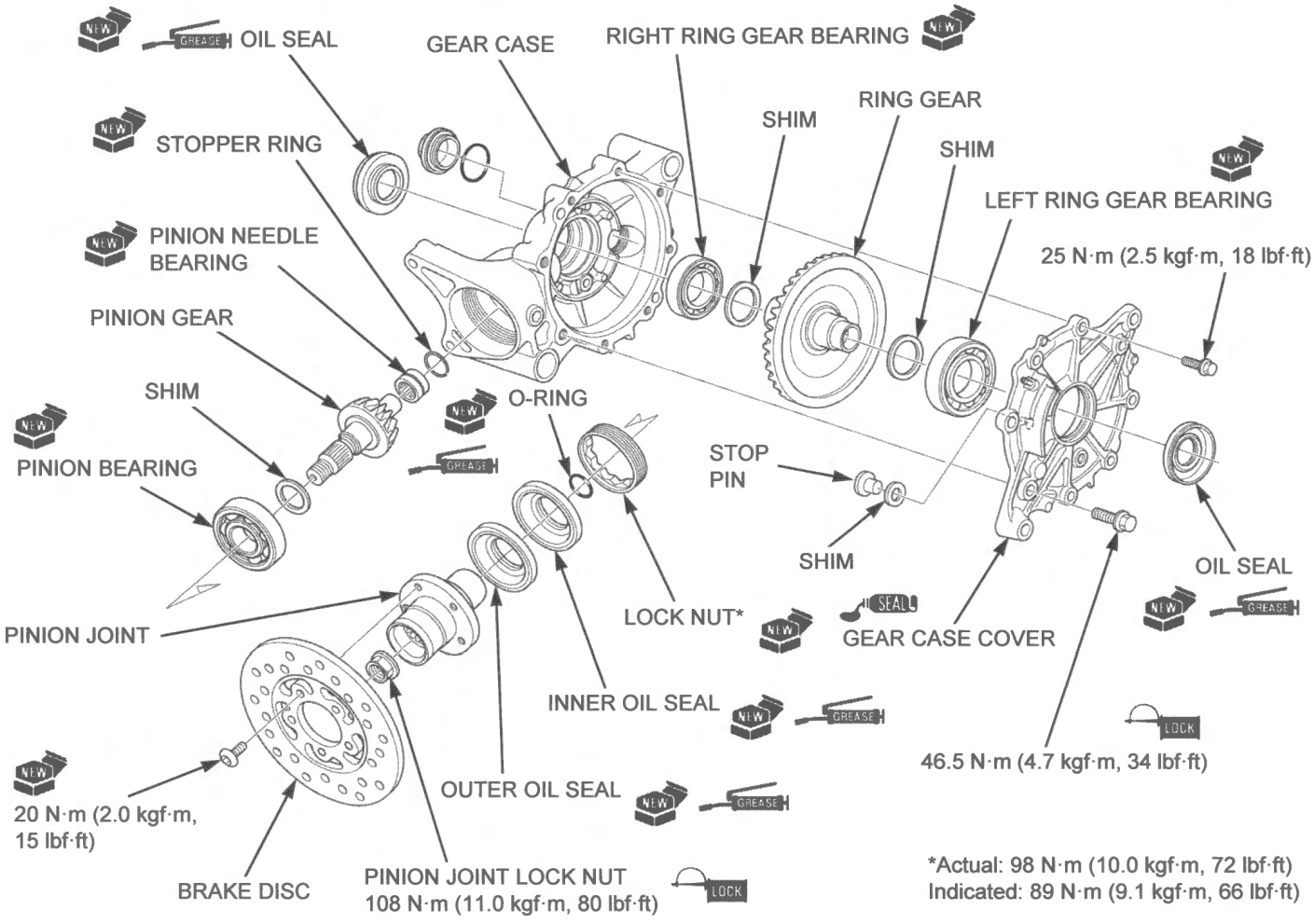
[3] Driver	**07949-3710001**
[4] Attachment, 24 x 26 mm	**07746-0010700**
[5] Pilot, 15 mm	**07746-0040300**

Only strike the driver once. If you strike it more than once, the stopper ring [6] may slip out of the groove.
If this happens, remove the ring and bearing, and install a new one again.

Make sure that the stopper ring is securely set in the groove of the gear case.



REAR FINAL DRIVE ASSEMBLY



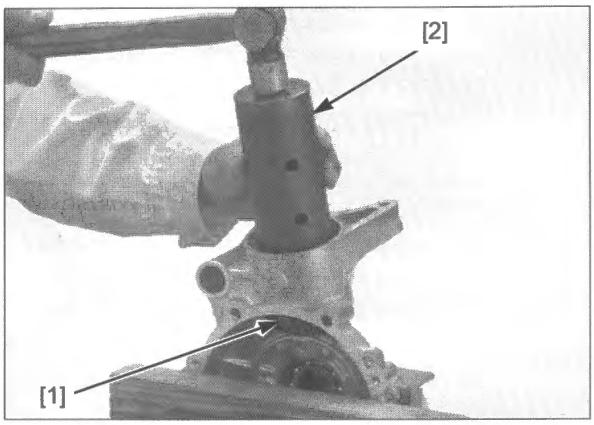
PINION GEAR INSTALLATION

Keep the driver centered with the bearing outer race during installation.

Drive the pinion gear assembly [1] into the gear case.

TOOL:

[2] Oil seal driver	**07965-KE80200 (not available in U.S.A.)** **07746-0010400 (U.S.A. only)**



Be sure to wear heavy gloves to avoid burns when handling the heated gear case. Using a torch to heat the gear case may cause warpage.

Freeze the pinion gear and bearing.
Heat the gear case to 80°C (176°F).
Drop the cold pinion assembly into the warm gear case.

Install a new lock nut [1] and tighten it using the special tool.

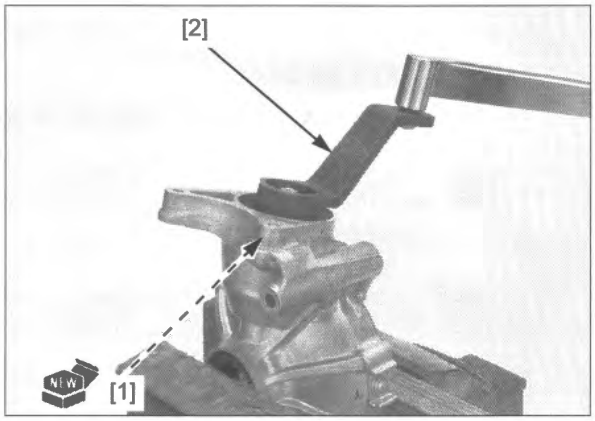
TOOL:

[2] Holding tool Snap-on YA6010A or equivalent

Refer to torque wrench reading information on "Service Information" (page 22-2).

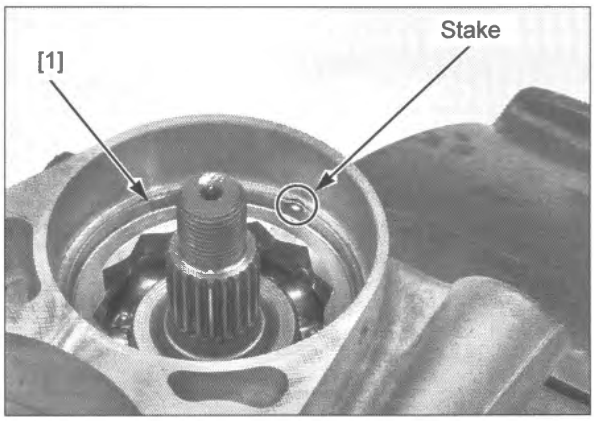
TORQUE:

Actual: 98 N·m (10.0 kgf·m, 72 lbf·ft)
Indicated: 89 N·m (9.1 kgf·m, 66 lbf·ft)



Be careful not to damage the threads of the case.

Stake the lock nut [1] into the case groove.

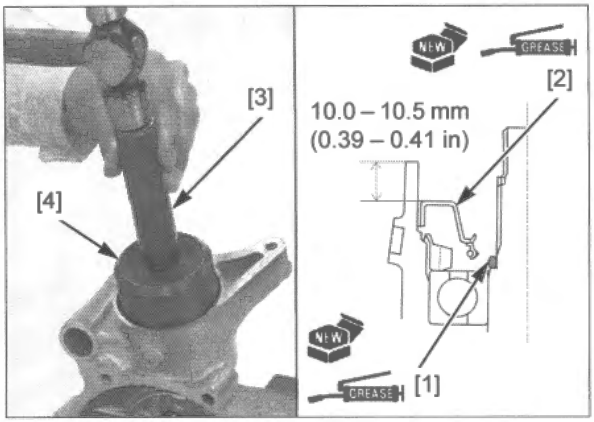


Coat a new O-ring [1] with grease and install it onto the pinion gear shaft.

Apply grease to the lips of new oil seals.
Install the inner oil seal [2] into the gear case until it is 10.0 – 10.5 mm (0.39 – 0.41 in) from the top surface of gear case.

TOOLS:

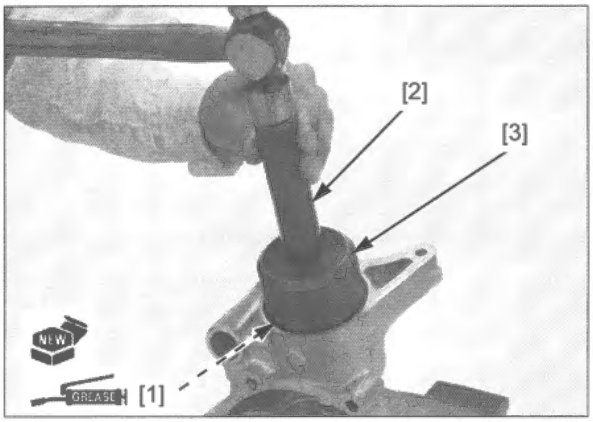
[3] Driver	**07749-0010000**
[4] Driver attachment	**07LAD-PW50500**



Install the outer oil seal [1] into the gear case until it is flush with the gear case outer surface, using the same tool.

TOOLS:

[2] Driver	**07749-0010000**
[3] Driver attachment	**07LAD-PW50500**



Clean the threads of the pinion gear shaft thoroughly.

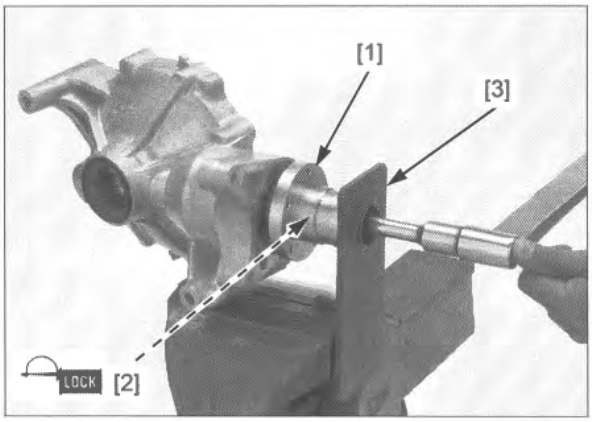
Install the pinion joint [1] onto the pinion gear shaft, being careful not to damage the oil seal lips.

Apply locking agent to the threads of the pinion joint nut [2] and screw it in by hand as far as it goes.
Hold the pinion joint with the special tool and tighten the joint nut.

TOOL:

[3] Pinion holder	**07SMB-HM70200**

TORQUE: 108 N·m (11.0 kgf·m, 80 lbf·ft)

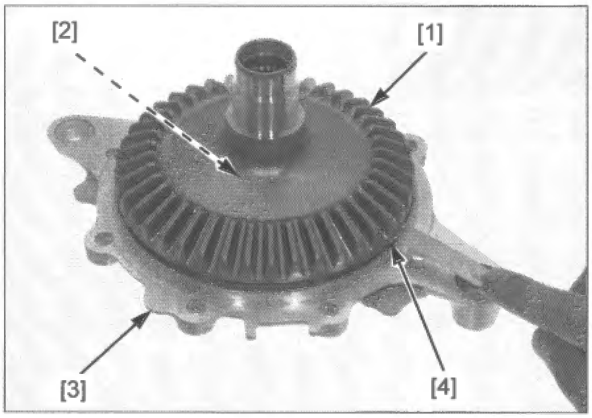


RING GEAR CLEARANCE INSPECTION

Install the ring gear [1] with the shim [2] into the case cover [3].

Measure the clearance between the ring gear and stop pin [4] with a feeler gauge.

CLEARANCE: 0.3 – 0.6 mm (0.01 – 0.02 in)



Remove the ring gear.

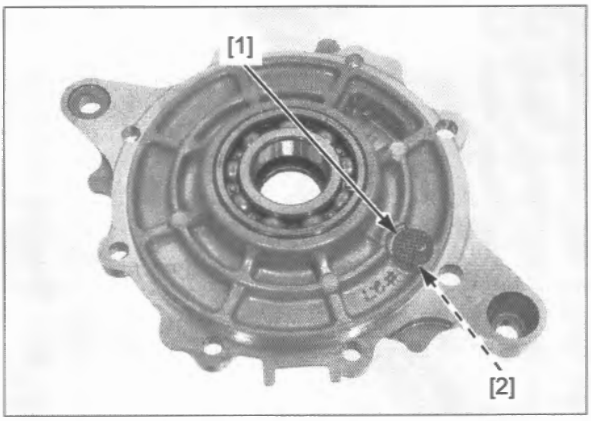
Be sure to wear heavy gloves to avoid burns when handling the heated case cover. Using a torch to heat the case cover may cause warpage.

If the clearance is not within specification, heat the case cover to approximately 80°C (176°F) and remove the stop pin [1] by tapping the cover.

Install a stop pin shim [2] to obtain the correct clearance.

STOP PIN SHIMS:
A: 0.10 mm (0.004 in)
B: 0.15 mm (0.006 in)

Drive the stop pin into the case cover.



FINAL GEAR CASE ASSEMBLY

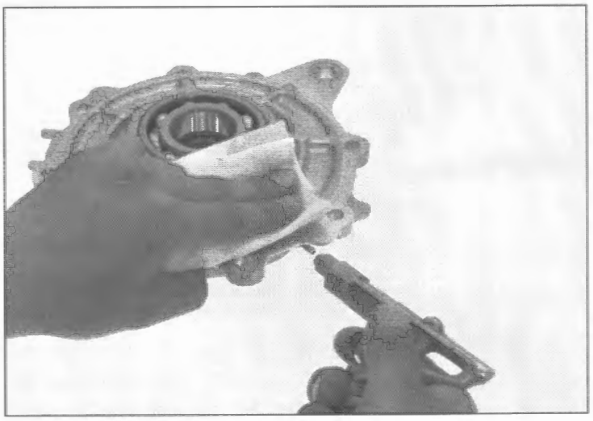
NOTE:

- When the gear set, bearing, and/or gear case has been replaced, check the tooth contact pattern (page 22-38).
  Check the gear backlash (page 22-38).

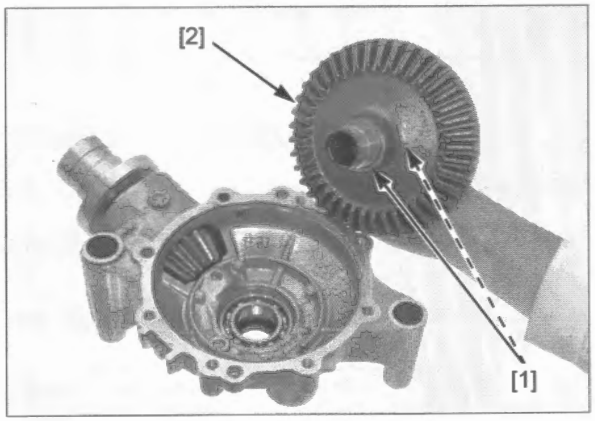
Keep dust and dirt out of the case and cover.

Clean the mating surface of the gear case and cover, being careful not to damage them.

Blow compressed air through the breather holes in the gear case and cover.



Install the proper ring gear shims [1] onto the ring gear [2] and install them into the gear case.



Apply sealant to the case cover [1] mating surface.

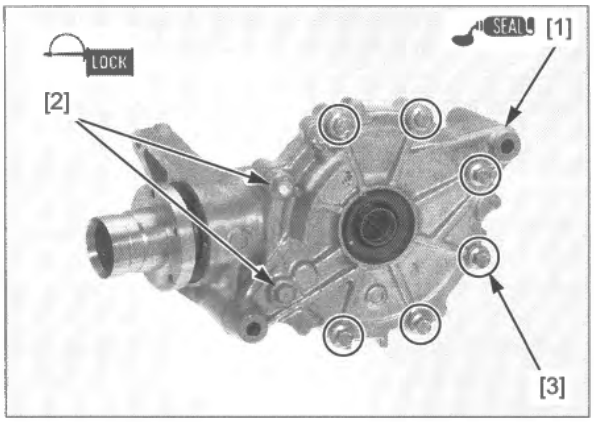
Install the case cover onto the gear case.

Apply locking agent to the threads of the two 10 mm bolts [2].

It is important to turn the pinion while tightening the bolts. If the ring gear shim is too thick, the gears will lock after only light tightening.

Install the cover bolts [3] and tighten them in several steps until the cover evenly touches the case. Then, while rotating the pinion gear, tighten the bolts to the specified torque in a crisscross pattern in several steps.

TORQUE:
10 mm bolt [2]: 46.5 N·m (4.7 kgf·m, 34 lbf·ft)
8 mm bolt [3]: 25 N·m (2.5 kgf·m, 18 lbf·ft)

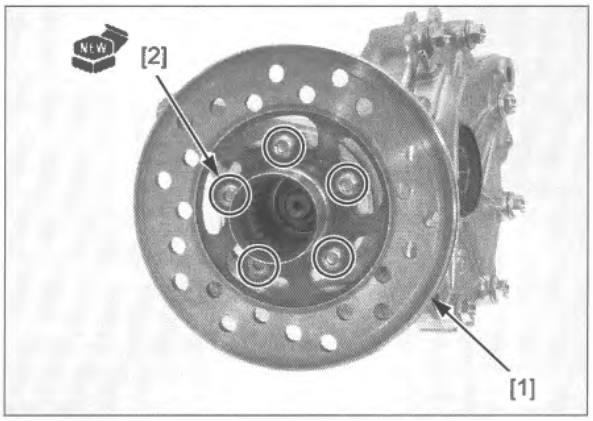


Check that the gear assembly turns smoothly without binding.

Install the rear brake disc [1].

Install and tighten new brake disc bolts [2]

TORQUE: 20 N·m (2.0 kgf·m, 15 lbf·ft)

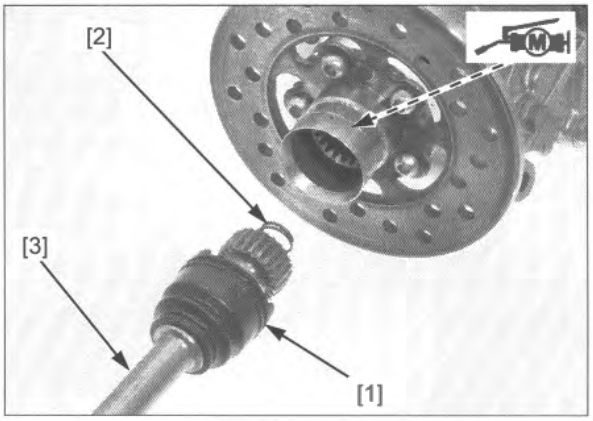


INSTALLATION

Install the boot [1] and joint spring [2] to the propeller shaft [3].

Apply 5 – 8 g of molybdenum disulfide grease to the pinion joint splines.

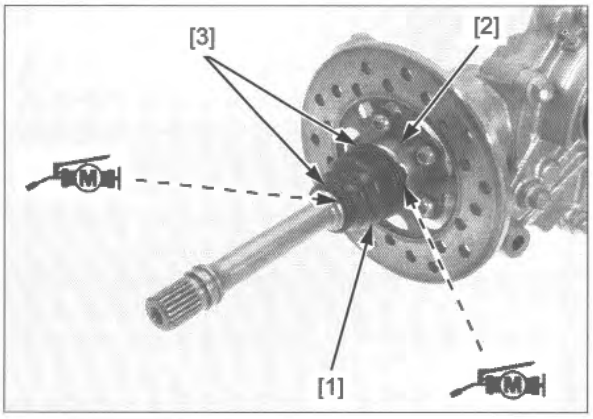
Connect the propeller shaft while aligning the splines properly while compressing the joint spring.



Apply molybdenum disulfide grease to the boot contacting area of propeller shaft and pinion joint.

Install the propeller shaft boot [1] onto the pinion joint [2] of the gear case.

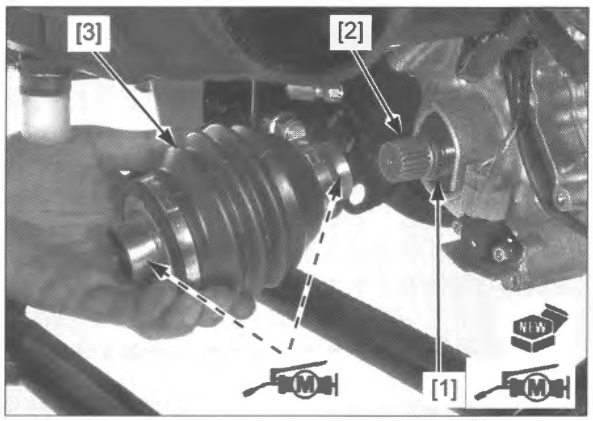
Install the boot bands [3] into the grooves of the boot.



Coat a new O-ring [1] with molybdenum disulfide grease and install it into the groove in the engine output shaft [2].

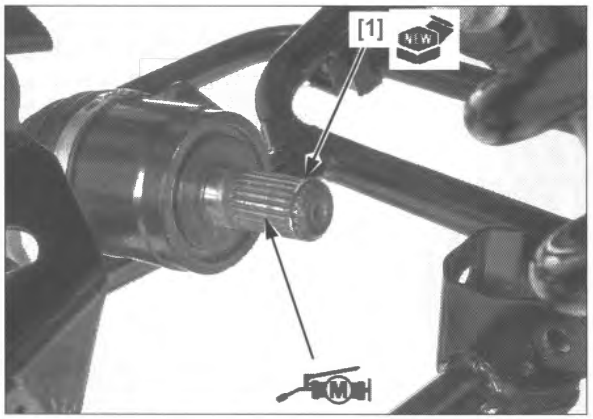
Apply molybdenum disulfide grease to the splines of the both sides in the universal joint [3].

Install the universal joint to the engine output shaft until it is fully seated.



Install a new stopper ring [1] into the groove in the inboard joint splines of the left rear drive shaft.

Apply molybdenum disulfide grease to the inboard joint spline.

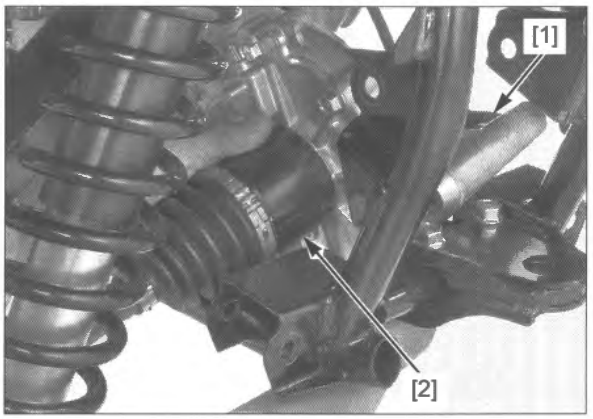


Place the gear case assembly [1] into the frame.

Be careful not to damage the oil seal in the gear case.

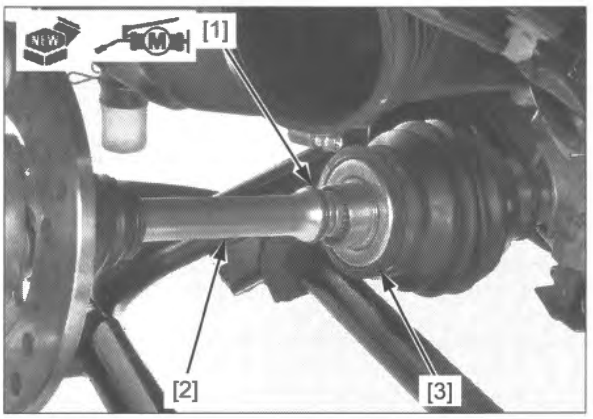
Install the left rear drive shaft by holding the inboard joint [2] until the stopper ring seats in the groove of the ring gear.

Make sure that the stopper ring is seated properly by pulling on the inboard joint lightly.



Coat a new O-ring [1] with molybdenum disulfide grease and install it into the groove in the propeller shaft [2].

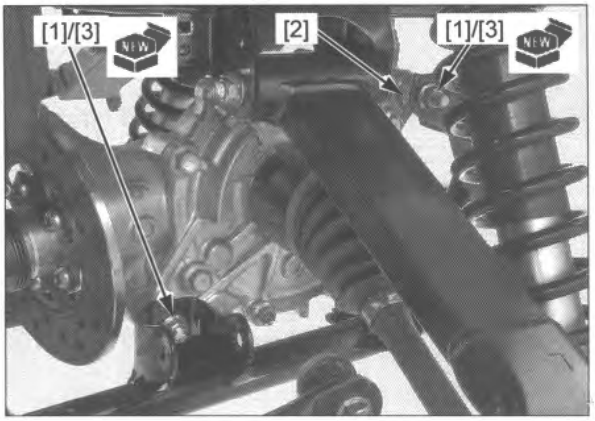
Connect the propeller shaft into the universal joint [3] until it is fully seated.



Align the bolt holes and install the mounting bolts [1] from the right side.
Set the rear collar [2] between the left side of gear case and frame.

Install new mounting nuts [3] and tighten them.

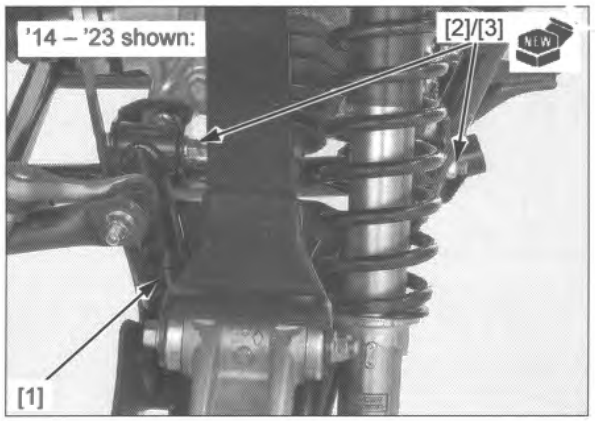
TORQUE: 44 N·m (4.5 kgf·m, 32 lbf·ft)



Position the left lower arm [1] into the frame pivot point.

Install the pivot bolts from the front side.

Install the lower arm pivot bolts [2] and new nuts [3], then loosely tighten them.



'14 - '23

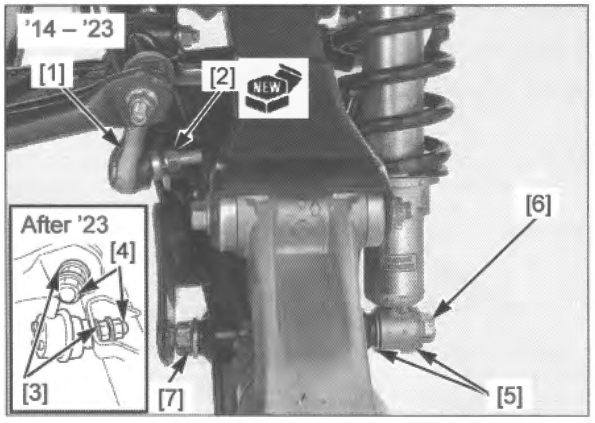
Connect the stabilizer link [1] with a new nut [2] and tighten it to the specified torque while holding the stud bolt end.

TORQUE: 39 N·m (4.0 kgf·m, 29 lbf·ft)

After '23

Connect the stabilizer link with a flange nut [3], cap nut [4] and tighten it to the specified torque.

TORQUE (after '22):
Stabilizer link cap nut:
34 N·m (3.5 kgf·m, 25 lbf·ft)
Stabilizer link flange nut:
54 N·m (5.5 kgf·m, 40 lbf·ft)



Install the bolt from the rear side.

Install the washers [5], bolt [6] and a new shock absorber lower mounting nut [7] and tighten it to the specified torque.

TORQUE: 88 N·m (9.0 kgf·m, 65 lbf·ft)

Set the rear brake caliper in position, then install new mounting bolts [1] and tighten them to the specified torque.

TORQUE: 30 N·m (3.1 kgf·m, 22 lbf·ft)

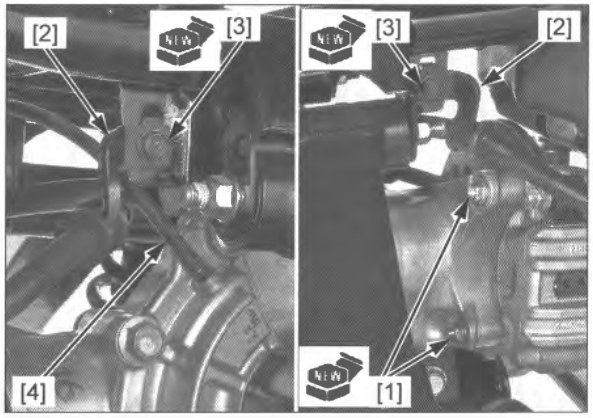
Set the rear brake hose clamps [2] to the frame, then install and tighten new bolts [3].

Connect the rear final gear case breather hose [4].

Install the following:

- air cleaner sub chamber (page 7-18)
- right rear lower arm (page 19-13)
- right rear drive shaft (page 22-12)
- rear wheels (page 19-6)

Fill the gear case with the recommended oil (page 3-19).



23. BATTERY/CHARGING SYSTEM

SERVICE INFORMATION 23-2

TROUBLESHOOTING 23-3

COMPONENT LOCATION 23-4

SYSTEM DIAGRAM 23-4

BATTERY 23-5

CHARGING SYSTEM INSPECTION 23-6

ALTERNATOR CHARGING COIL 23-7

REGULATOR/RECTIFIER 23-7

MAIN RELAY 23-8

DIODE 23-8

SERVICE INFORMATION

GENERAL

⚠WARNING

- The battery gives off explosive gases; keep sparks, flames and cigarettes away. Provide adequate ventilation when charging.
- The battery contains sulfuric acid (electrolyte). Contact with skin or eyes may cause severe burns. Wear protective clothing and a face shield.
  - If electrolyte gets on your skin, flush with water.
  - If electrolyte gets in your eyes, flush with water for at least 15 minutes and call a physician immediately.
- Electrolyte is poisonous.
  - If swallowed, drink large quantities of water or milk and call your local Poison Control Center or a physician immediately.

NOTICE

- *Always turn OFF the ignition switch before disconnecting any electrical component.*
- *Some electrical components may be damaged if terminals or connectors are connected or disconnected while the ignition switch is ON and current is present.*

- For extended storage, remove the battery, give it a full charge, and store it in a cool, dry space.
- For a battery remaining in a stored vehicle, disconnect the negative battery cable from the battery.
- The maintenance free battery must be replaced when it reaches the end of its service life.
- The battery can be damaged if overcharged or undercharged, or if left to discharge for long period. These same conditions contribute to shortening the "life span" of the battery. Even under normal use, the performance of the battery deteriorates after 2 – 3 years.
- Battery voltage may recover after battery charging, but under heavy load, the battery voltage will drop quickly and eventually die out. For this reason, the charging system is often suspected as the problem. Battery overcharge often results from problems in the battery itself, which may appear to be an overcharging symptom. If one of the battery cells is shorted and battery voltage does not increase, the regulator/rectifier supplies excess voltage to the battery. Under these conditions, the electrolyte level goes down quickly.
- Before troubleshooting the charging system, check for proper use and maintenance of the battery. Check if the battery is frequently under heavy load, such as having the headlight and taillight on for long periods of time without riding the vehicle.
- The battery will self-discharge when the vehicle is not in use. For this reason, charge the battery every two weeks to prevent sulfation from occurring.
- When checking the charging system, always follow the steps in the troubleshooting (page 23-3).
- For alternator stator removal/installation, refer to Alternator/Starter Clutch section (page 15-8).
- The following color codes are used throughout this section.

Bl = Black	Bu = Blue	Gr = Gray	O = Orange	R = Red	W = White
Br = Brown	G = Green	Lg = Light green	P = Pink	Lb = Light blue	Y = Yellow
V = Violet					

BATTERY CHARGING

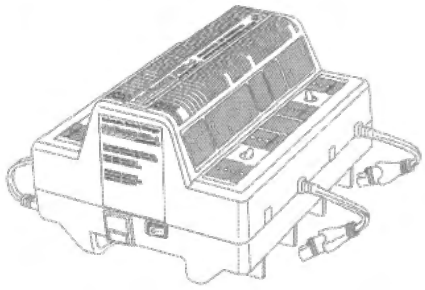
- Turn power ON/OFF at the charger, not at the battery terminal.
- For battery charging, do not exceed the charging current and time specified on the battery. Using excessive current or extending the charging time may damage the battery.
- Quick charging should only be done in an emergency; slow charging is preferred.

BATTERY TESTING

Refer to the instructions in the Operation Manual for the recommended battery tester for details about battery testing. The recommended battery tester puts a "load" on the battery so that the actual battery condition can be measured.

Recommended battery tester: Micro 404XL (U.S.A. only)

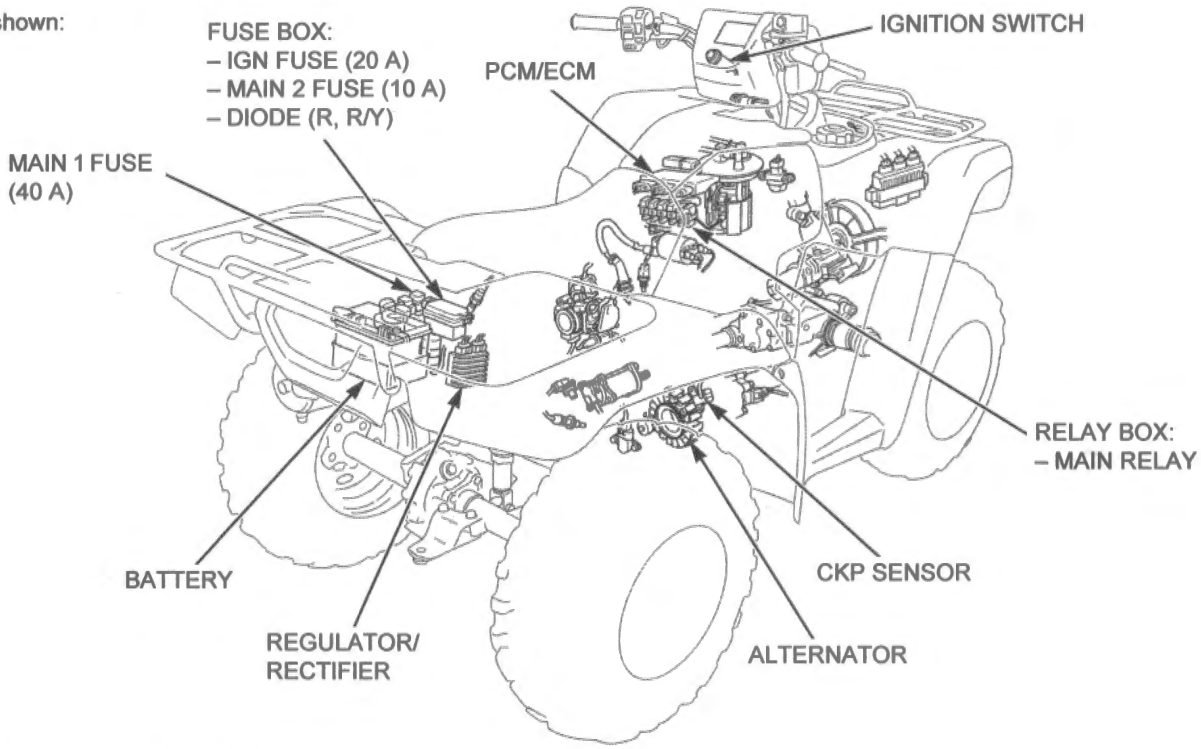
TOOLS

Motorcycle battery analyzer MDX604P (U.S.A. only)	Optimate Pro-4 Battery Charger TMNTS53 (U.S.A. only)
	

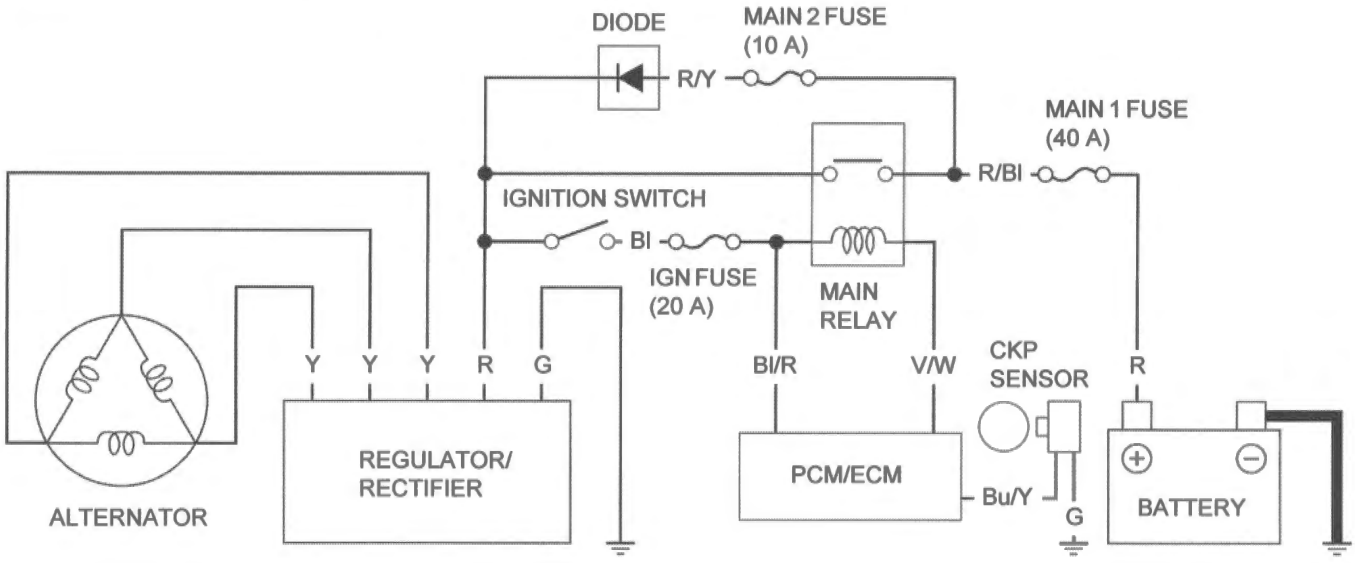
TROUBLESHOOTING

Unusual condition		Probable cause (Check in numerical order)
Battery	Battery is damaged or weak	1. Faulty battery 2. Current leakage higher than specified value – Faulty ignition switch – Shorted wire harness 3. Faulty alternator charging coil 4. Faulty regulator/rectifier 5. Faulty main relay or its circuit 6. Open circuit or loose connection in the wire harness

COMPONENT LOCATION



SYSTEM DIAGRAM



BATTERY

REMOVAL/INSTALLATION

Remove the rear fender cover (page 2-12).

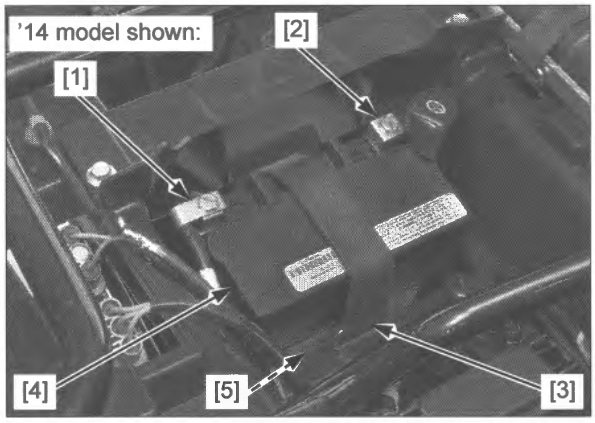
Turn the ignition switch OFF and disconnect the negative (–) cable [1] first, then disconnect the positive (+) cable [2] by removing the terminal bolts.

Remove the battery holder band [3].
Remove the battery [4] and battery rubber [5].

Installation is in the reverse order of removal.

NOTE:

- Connect the positive (+) cable first and then the negative (–) cable.

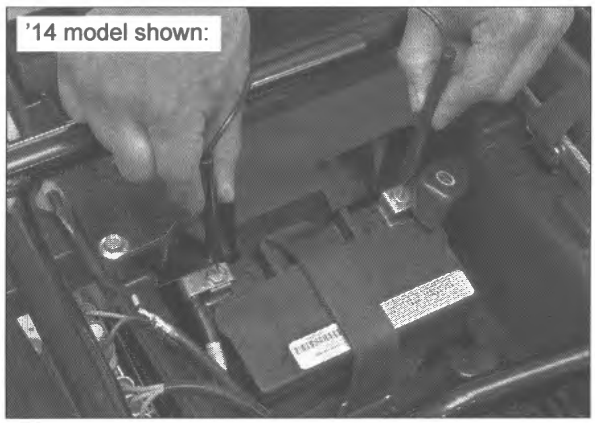


VOLTAGE INSPECTION

Remove the rear fender cover (page 2-12).

Measure the battery voltage using a commercially available digital multimeter.

VOLTAGE (20°C/68°F):
Fully charged: 13.0 – 13.2 V
Under charged: Below 12.4 V



BATTERY TESTING

Remove the battery (page 23-5).

Refer to the instructions that are appropriate to the battery testing equipment available to you.

TOOL:

Motorcycle battery analyzer	**MDX604P (U.S.A. only)**

BATTERY CHARGING (U.S.A. only)

Remove the battery (page 23-5).

Refer to the instructions that are appropriate to the battery charging equipment available to you.

TOOL:

Optimate Pro-4 Battery Charger	**TMNTS53 (U.S.A. only)**

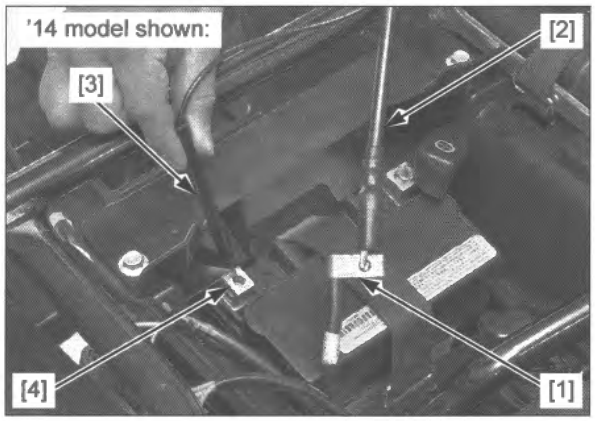
CHARGING SYSTEM INSPECTION

CURRENT LEAKAGE INSPECTION

Remove the rear fender cover (page 2-12).

Turn the ignition switch OFF and disconnect the negative (–) cable [1] from the battery.

Connect the ammeter (+) probe [2] to the negative (–) cable and the ammeter (–) probe [3] to the battery (–) terminal [4].



With the ignition switch turned OFF, check for current leakage.

NOTE:

- When measuring current using a tester, set it to a high range, and then bring the range down to an appropriate level. Current flow higher than the range selected may blow out the fuse in the tester.
- While measuring current, do not turn the ignition switch ON. A sudden surge of current may blow out the fuse in the tester.

SPECIFIED CURRENT LEAKAGE:
FM1/FM2/FE1/FE2: 1 mA maximum
FM5/FM6/FM7/FA5/FA6/FA7: 0.31 mA maximum

If current leakage exceeds the specified value, a shorted circuit is likely.

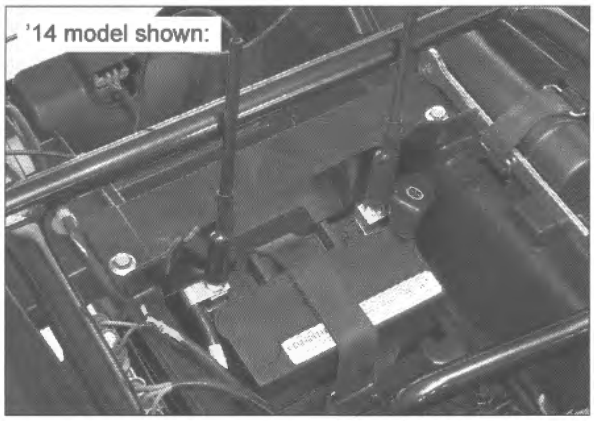
Locate the short by disconnecting connections one by one and measuring the current.

CHARGING VOLTAGE INSPECTION

NOTE:

- Be sure the battery is in good condition before performing this test.

Remove the rear fender cover (page 2-12).



Warm up the engine to normal operating temperature.

Connect the multimeter between the battery positive (+) and negative (–) terminals.

NOTE:

- To prevent a short, make absolutely certain which are the positive (+) and negative (–) terminals or cables.
- Do not disconnect the battery or any cable in the charging system without first switching off the ignition switch. Failure to follow this precaution can damage the tester or electrical components.

Restart the engine and turn the headlight on.

Measure the voltage on the multimeter when the engine runs at 5,000 rpm.

Standard:
Measured BV < Measured CV < 15.5 V

- **BV = Battery voltage (page 23-5)**
- **CV = Charging voltage**

ALTERNATOR CHARGING COIL

INSPECTION

Remove the rear fender cover (page 2-12).

Disconnect the stator 3P (Gray) connector [1].

Check the connector for loose contacts or corroded terminals.

Measure the resistance between the Yellow wire terminals of the alternator side connector.

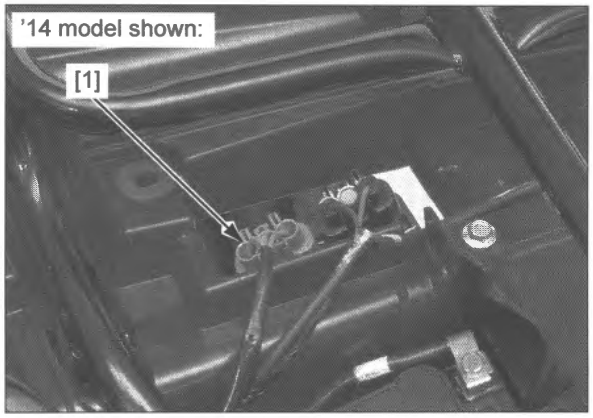
Standard: 0.1 – 1.0 Ω (20°C/68°F)

Check for continuity between each Yellow wire terminal of the alternator side connector and ground.

There should be no continuity.

Replace the alternator stator if resistance is out of specification, or if any wire has continuity to ground.

For alternator stator replacement (page 15-8).



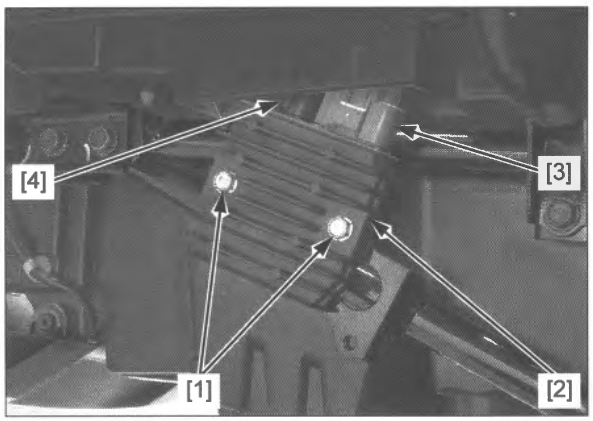
REGULATOR/RECTIFIER

REMOVAL/INSTALLATION

Remove the bolts [1] and regulator/rectifier [2].

Disconnect the stator 3P (Gray) [3] and regulator/rectifier 3P (Black) [4] connectors.

Installation is in the reverse order of removal.



WIRE HARNESS INSPECTION

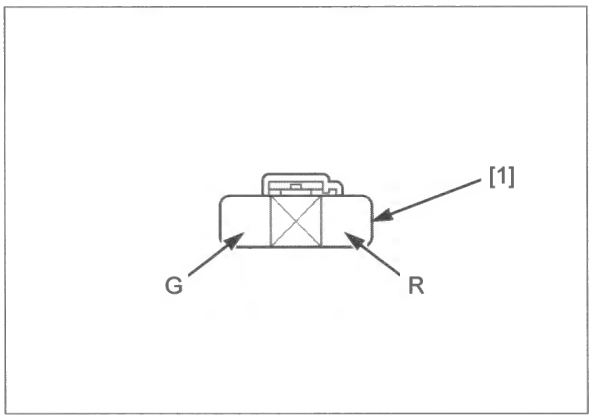
Disconnect the regulator/rectifier 3P (Black) connector [1] (page 23-7).

Check the connector for loose contacts or corroded terminals.

Check the following at the wire harness side connector.

Battery Line:
Measure the voltage between the Red wire terminal and ground.
There should be battery voltage at all times.

Ground Line:
Check for continuity between the Green wire terminal and ground.
There should be continuity at all times.

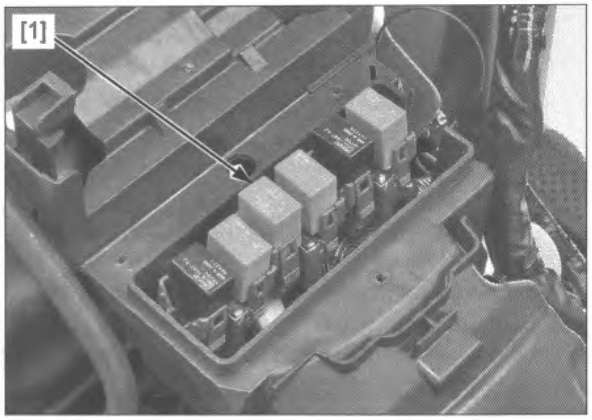


MAIN RELAY

Remove the relay box lid (page 6-11).

Turn the ignition switch OFF.

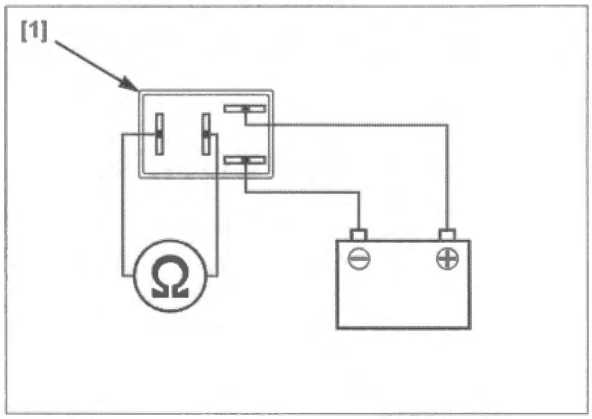
Remove the main relay [1].



Connect an ohmmeter to the terminals of the main relay [1].

Connect a 12 V battery to the main relay terminals as shown.

There should be continuity only when the 12 V battery is connected.
If there is no continuity when the 12 V battery is connected, replace the main relay.



DIODE

Remove the rear fender cover (page 2-12).

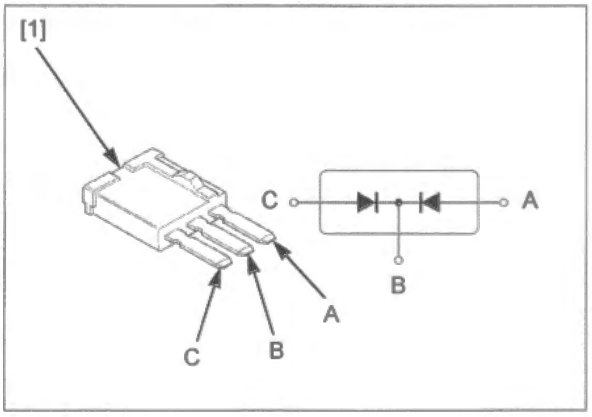
Remove the cover and diode [1].



Check for continuity between the diode [1] terminals.

When there is continuity, a small resistance value will register.

If there is continuity in one direction, the diode is normal.



24. LIGHTS/METERS/SWITCHES

SERVICE INFORMATION 24-2

COMPONENT LOCATION 24-2

ASSIST HEADLIGHT 24-3

HEADLIGHT 24-5

BRAKE/TAILLIGHT 24-6

COMBINATION METER 24-7

ACCESSORY SOCKET 24-12

IGNITION SWITCH 24-13

LEFT HANDLEBAR SWITCH 24-15

FRONT BRAKE INHIBITOR SWITCH 24-15

REAR BRAKE LIGHT SWITCH 24-16

GEAR POSITION SWITCH ('14 – '19 FE/FM models) 24-17

COOLING FAN 24-18

FUEL GAUGE/FUEL LEVEL SENSOR 24-20

DIODE 24-21

SERVICE INFORMATION

GENERAL

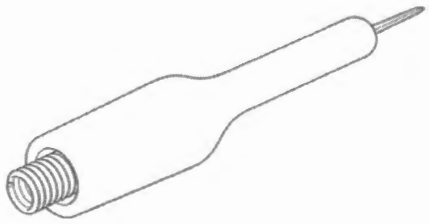
NOTICE

- *Note the following when replacing the halogen headlight bulb.*
  - *Wear clean gloves while replacing the bulb. Do not put fingerprints on the headlight bulb, as they may create hot spots on the bulb and cause it to break.*
  - *If you touch the bulb with your bare hands, clean it with a cloth moistened with alcohol to prevent its early failure.*
- All plastic connectors have locking tabs that must be released before disconnecting, and must be aligned when reconnecting.
- To isolate an electrical failure, check the continuity of the electrical path through the part. A continuity check can usually be made without removing the part from the vehicle. Simply disconnect the connectors and connect a continuity tester to the terminals or connections.
- The following color codes are used throughout this section.

Bl = Black	Bu = Blue	Gr = Gray	O = Orange	R = Red	W = White
Br = Brown	G = Green	Lg = Light green	P = Pink	Lb = Light blue	Y = Yellow
V = Violet					

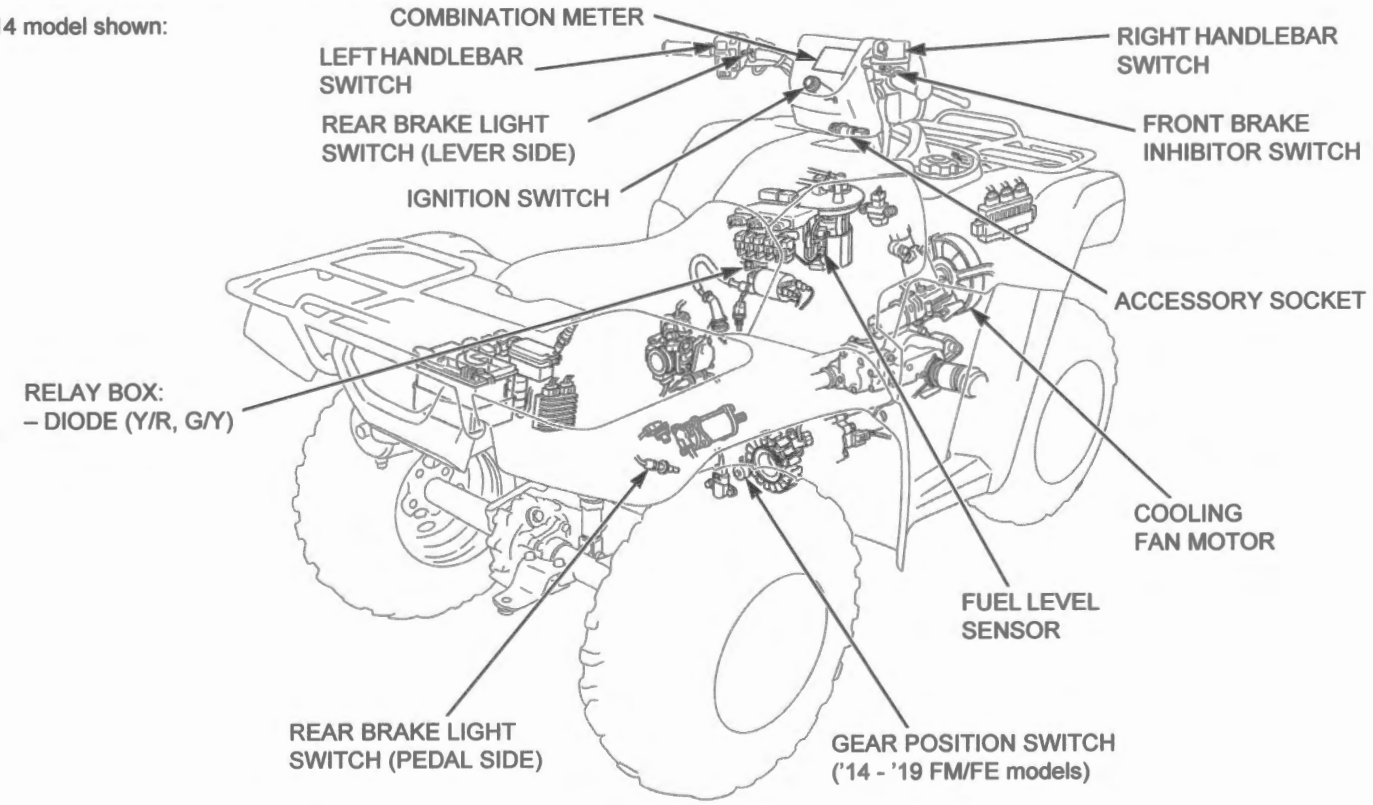
TOOL

Pin Probe Male (2 pack)
07ZAJ-RDJA110



COMPONENT LOCATION

'14 model shown:



ASSIST HEADLIGHT

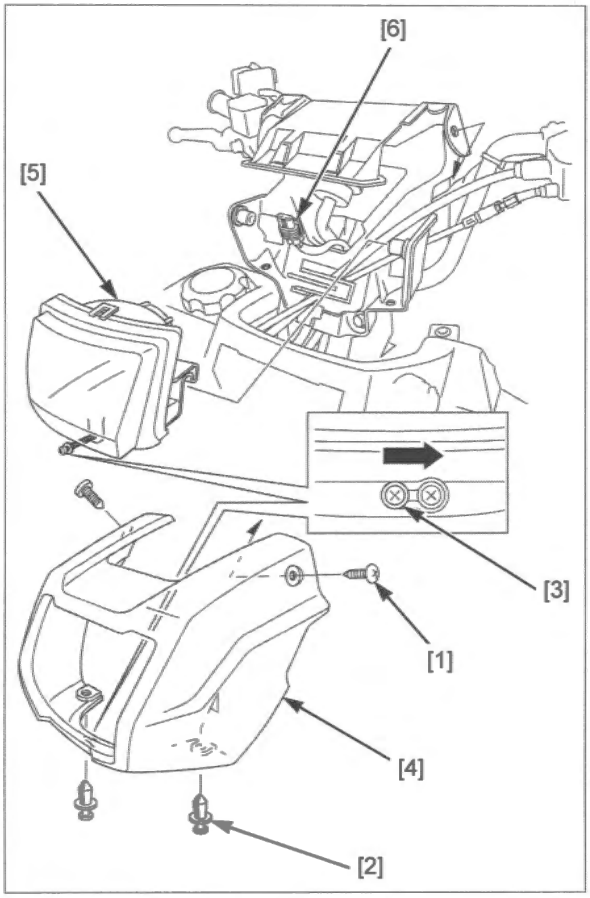
'14 – '19 FM1/FM2/FE1/FE2:

REMOVAL/INSTALLATION

Remove the screws [1] and trim clips [2].

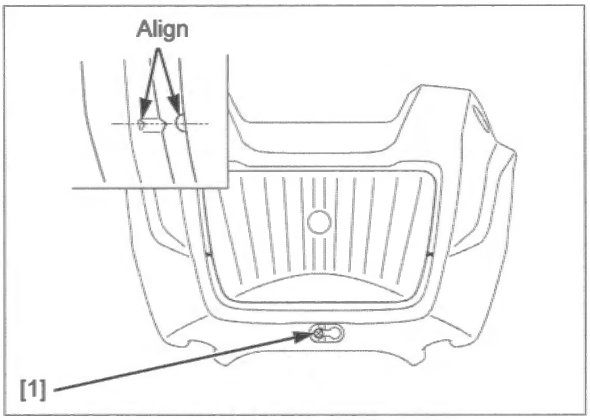
Disengage the adjusting screw [3] while pushing the assist headlight cover [4] in against the headlight unit [5].

Remove the headlight unit and disconnect the 3P connector [6].



Install the assist headlight unit and removed parts in the reverse order of removal.

After installing the headlight, align the reference marks on the assist headlight with the index marks on the cover by turning the adjusting screw [1].



BULB REPLACEMENT

Remove the assist headlight (page 24-3).

Remove the retainer ring [1] by rotating it counterclockwise.

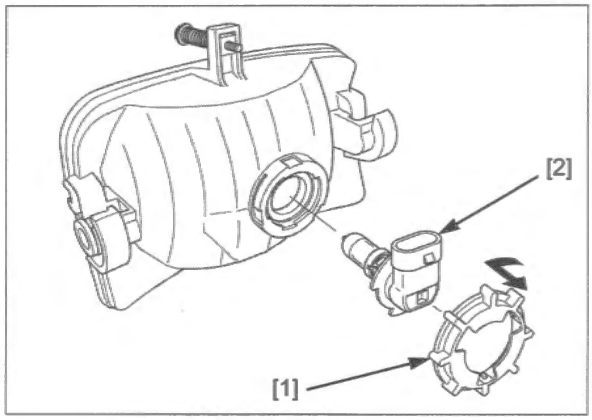
Replace the assist headlight bulb [2].

NOTICE

Avoid touching halogen headlight bulb. Fingerprints can create hot spots that cause a bulb to break.

- Install the assist headlight bulb with the connector side facing down by aligning the bulb tabs with the grooves of the assist headlight.

Install the removed parts in the reverse order of removal.



FM5/FM6/FM7/FA5/FA6/FA7 and After '19 FM1/FM2/FE2:

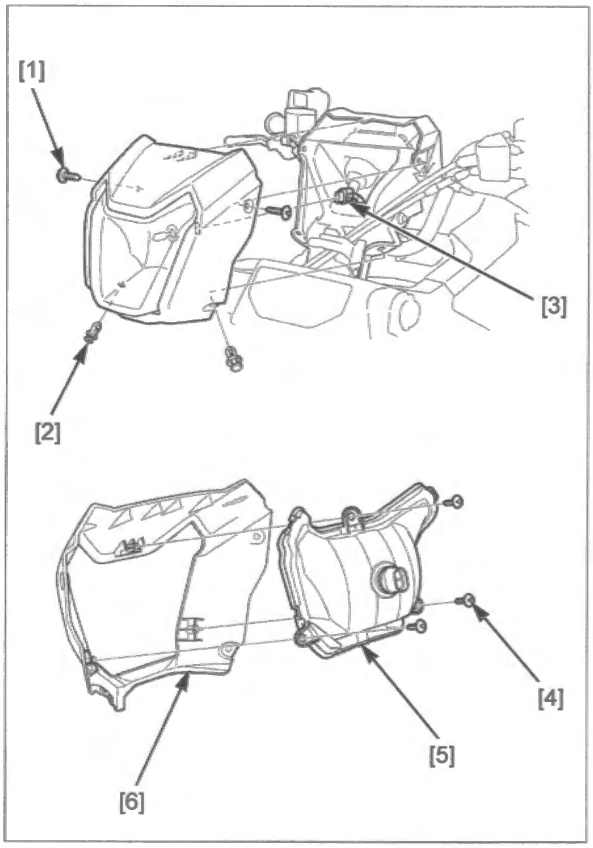
REMOVAL/INSTALLATION

Remove the screws [1] and trim clips [2].

Remove the assist headlight cover/unit and disconnect the 3P connector [3].

Remove the screws [4] and assist headlight unit [5] from the cover [6].

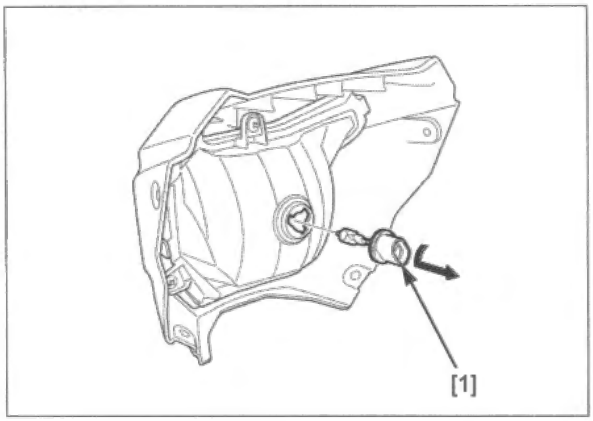
Install the assist headlight unit and removed parts in the reverse order of removal.



BULB REPLACEMENT

Remove the assist headlight unit/cover (page 24-4).

Remove the assist headlight bulb [1] by rotating it counterclockwise.



NOTICE

Avoid touching halogen headlight bulb. Fingerprints can create hot spots that cause a bulb to break.

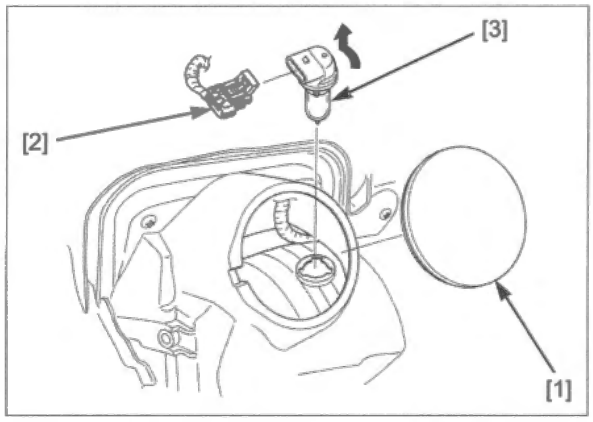
- Install the assist headlight bulb by aligning the bulb tabs with the grooves of the assist headlight.

Install the removed parts in the reverse order of removal.

HEADLIGHT

BULB REPLACEMENT

Remove the headlight cover cap [1].
Disconnect the headlight 3P connector [2].
Remove the headlight bulb [3] by turning it counterclockwise.



NOTICE

Avoid touching halogen headlight bulb. Fingerprints can create hot spots that cause a bulb to break.

Align the bulb tabs with the headlight grooves properly.

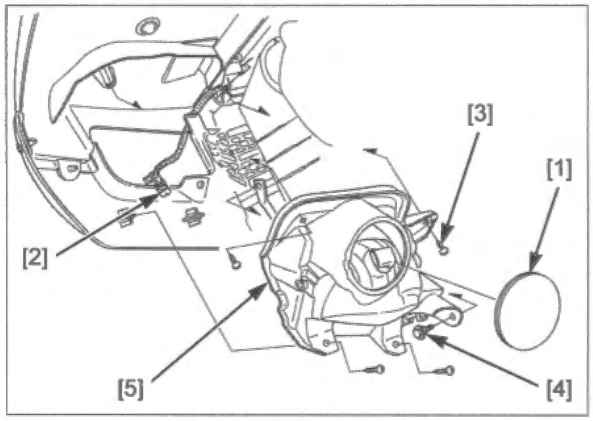
Install a new bulb in the reverse order of removal.

REMOVAL/INSTALLATION

Remove the headlight cover cap [1].
Disconnect the headlight 3P connector [2].

Remove the following:

- screws [3]
- mounting bolt [4]
- headlight assembly [5]



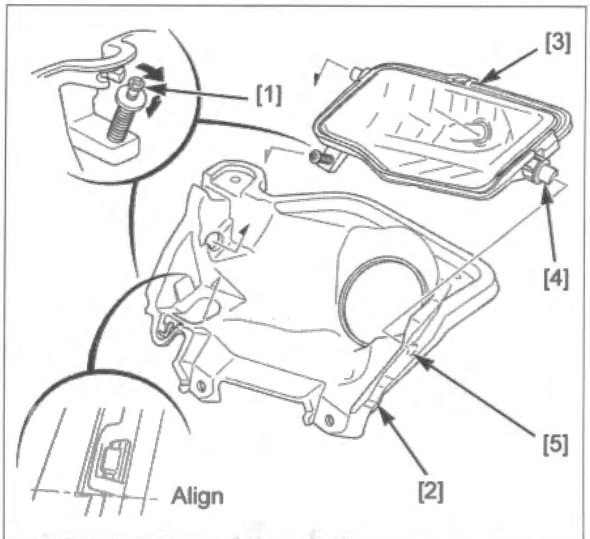
Release the adjusting screw [1] from the headlight cover [2].

Remove the headlight [3] by unhooking its bosses [4] from the headlight cover holes [5].

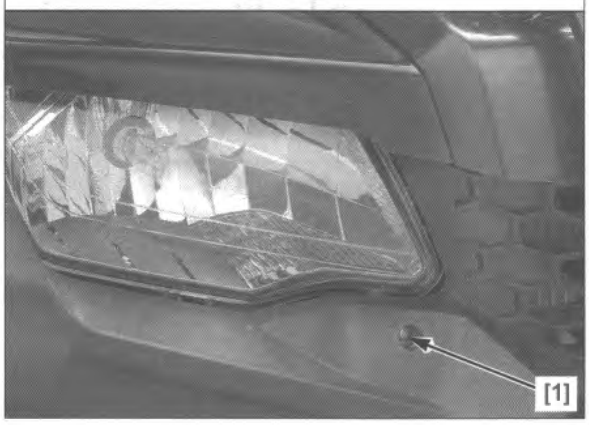
Route the headlight wire into the groove in the headlight cover properly.

Install the headlight unit in the reverse order of removal.

- After installing the headlight to the cover, align the headlight lens snap fit with the headlight cover lug by turning the adjusting screw as shown.



After installing the headlight assembly, adjust the headlight aim by turning the adjusting screw [1] if necessary.



BRAKE/TAILLIGHT

REPLACEMENT

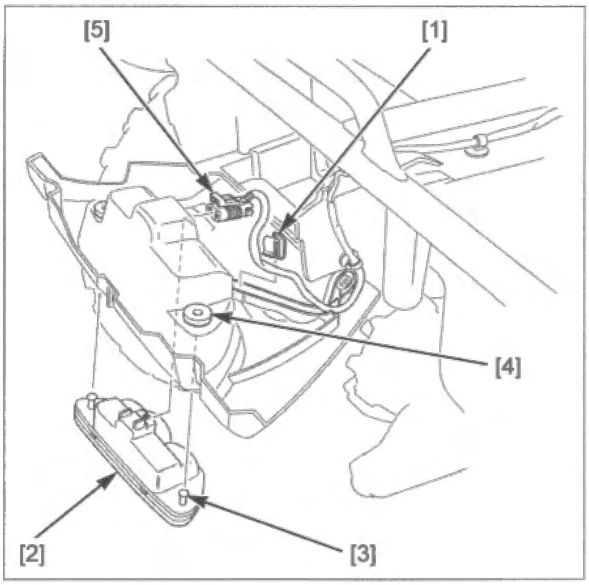
FM1/FM2/FE1/FE2:

Open the tool box lid.

Remove the clip [1].
Remove the brake/taillight [2] from the tool box lid by releasing the bosses [3] from the grommets [4].
Disconnect the brake/taillight 3P connector [5].

Install a new brake/taillight in the reverse order of removal.

- Route the wire properly (page 1-31).



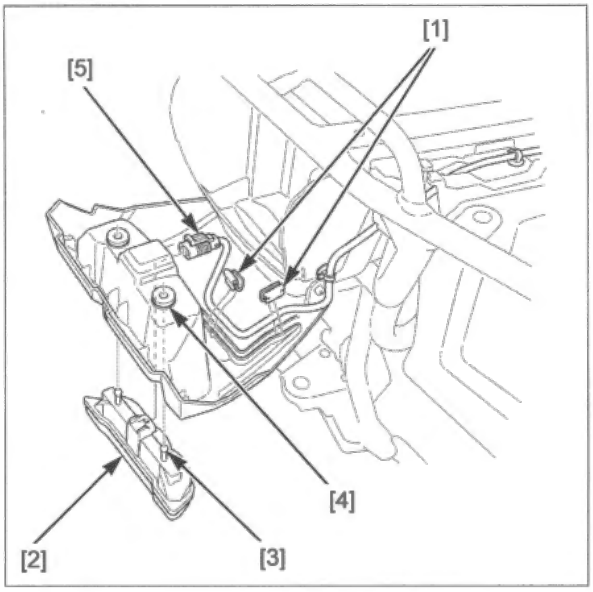
FM5/FM6/FM7/FA5/FA6/FA7:

Open the tool box lid.

Remove the clips [1].
Remove the brake/taillight [2] from the tool box lid by releasing the bosses [3] from the grommets [4].
Disconnect the brake/taillight 3P connector [5].

Install a new brake/taillight in the reverse order of removal.

- Route the wire properly (page 1-31).



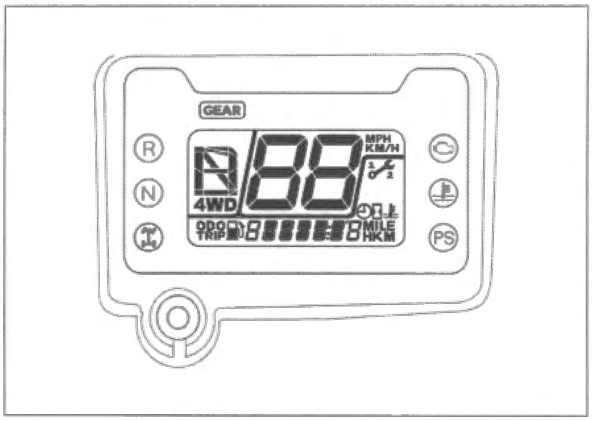
COMBINATION METER

INITIAL OPERATION CHECK

When the ignition switch is turned ON, the combination meter turns all the indicators on and shows all the LCD digital segments for a few seconds.

If the combination meter does not shows the initial operation, check its power/ground lines (page 24-7).

If the power/ground lines are OK, replace the combination meter assembly (page 24-11).

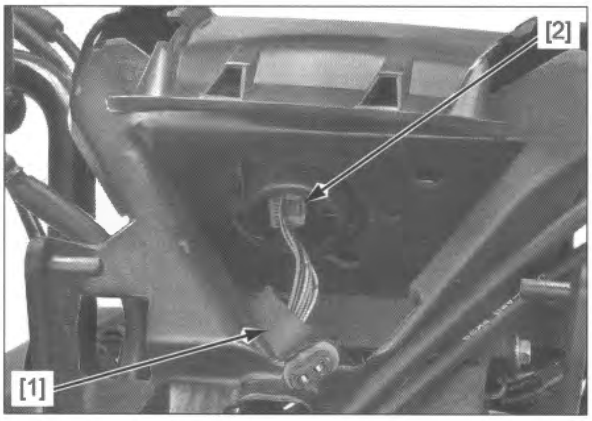


POWER/GROUND LINE INSPECTION

Remove the assist headlight cover (page 24-3).

Slide the boot [1] and disconnect the combination meter 16P (Gray) connector [2].

- Check the power and ground lines at the wire harness side connector.



POWER INPUT LINE

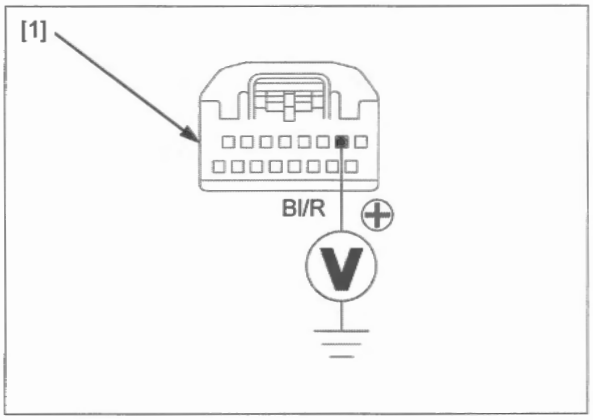
Measure the voltage between the combination meter 16P (Gray) connector [1] terminal and ground.

Connection: Black/red (+) – Ground (–)

There should be battery voltage with the ignition switch turned ON.

If there is no voltage, check the following:

- IGN fuse (20 A)
- Black/red wire between the combination meter and fuse box for an open circuit
- ignition switch (page 24-13)
- Black wire between the ignition switch and fuse box for an open circuit



BACK-UP VOLTAGE LINE

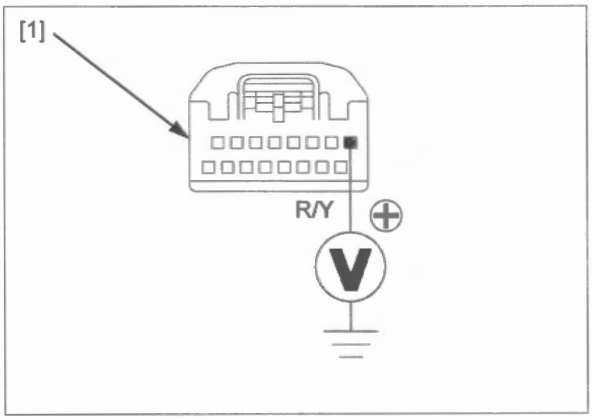
Measure the voltage between the 16P connector [1] terminal and ground.

Connection: Red/yellow (+) – Ground (–)

There should be battery voltage with the ignition switch turned ON.

If there is no voltage, check the following:

- MAIN 2 fuse (10 A)
- Red/yellow wire between the combination meter and fuse box for an open circuit



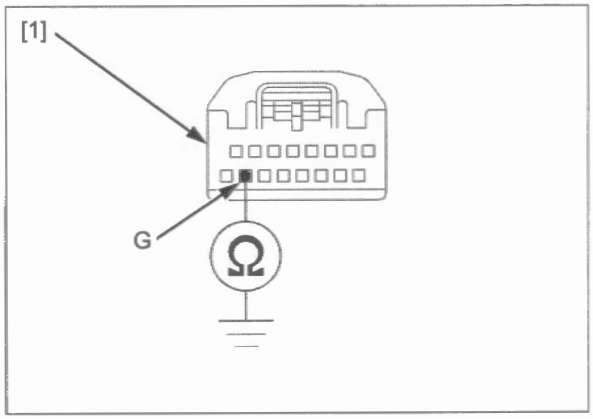
GROUND LINE

Check for continuity between the combination meter 16P (Gray) connector [1] terminal and ground.

There should be continuity all times.

Connection: Green – Ground

If there is no continuity, check for an open circuit in the Green wire.



SERIAL COMMUNICATION LINE

Gear position indicator continuously blinks "–", MIL, reverse, neutral, differential lock and high coolant temperature indicators come on

1. **PCM/ECM Power Input Inspection**

   Check that the engine can be started normally.

   Can the engine start?

   YES – GO TO STEP 2.

   NO – Check the PCM/ECM power/ground line (page 4-45).

2. **Connector Inspection**

   Check the combination meter 16P (Gray) connector and PCM/ECM 33P (Black) connector for loose contacts or corroded terminals.

   Are the connectors in good condition?

   YES – GO TO STEP 3.

   NO – Loose or poor contacts at the combination meter 16P (Gray) connector or PCM/ECM 33P (Black) connector.

3. **Combination Meter Serial Line Short Circuit Inspection**

   Disconnect the PCM/ECM 33P (Black) connector (page 4-45).

   Check for continuity between the wire harness side PCM/ECM 33P (Black) connector [1] terminal and ground.

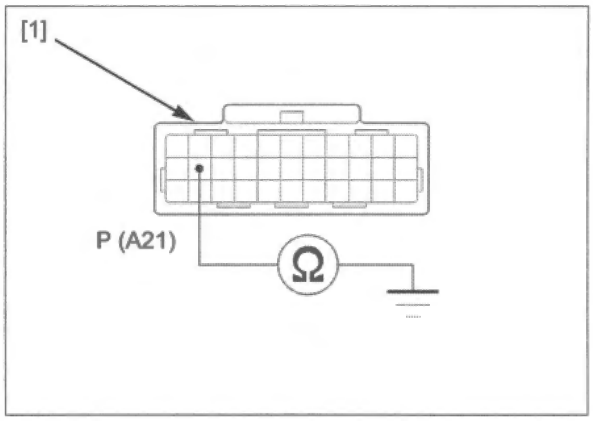
   TOOL:
   Pin Probe Male (2 pack) 07ZAJ-RDJA110

   Connection: Pink (A21) – ground

   Is there continuity?

   YES – Short circuit in the Pink wire.

   NO – GO TO STEP 4.



4. **Combination Meter Serial Line Open Circuit Inspection**

   Disconnect the combination meter 16P (Gray) connector (page 24-7).

   Check the continuity between the PCM/ECM 33P (Black) connector [1] and combination meter 16P (Gray) connector [2] terminals.

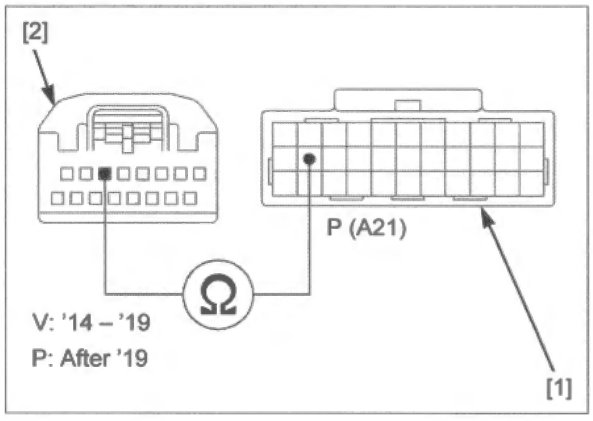
   TOOL:
   Pin Probe Male (2 pack) 07ZAJ-RDJA110

   Connection: Pink (A21) – Violet ('14 – '19)
   Pink (A21) – Pink (After '19)

   Is there continuity?

   YES – GO TO STEP 5.

   NO – Open circuit in the Pink and/or Violet wire.



5. PCM/ECM Circuit Inspection

Connect the PCM/ECM 33P (Black) connector.

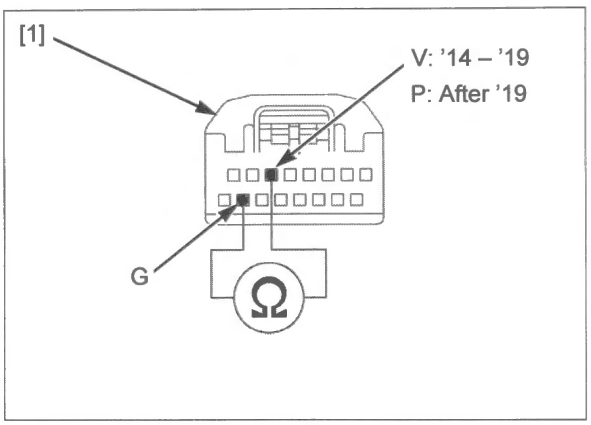
Turn the ignition switch ON and wait 5 seconds or more. Measure resistance at the combination meter 16P (Gray) connector [1] terminals.

Connection: Violet – Green ('14 – '19)
Pink – Green (After '19)

Is the resistance 0.1 kΩ – 100 kΩ?

YES – Replace the combination meter with a known good one, and recheck.

NO – Replace the PCM/ECM with a known good one, and recheck.



SPEEDOMETER

Speedometer does not operate

1. Combination Meter Power/Ground Line Inspection

Check the odometer/trip meter and indicators functions.

Do they function properly?

YES – GO TO STEP 2.

NO – Check the combination meter power/ground lines (page 24-7).

2. ESP System DTC Inspection

Check the ESP system DTC (page 25-9).

Is DTC 11-1 indicated?

YES – Perform the DTC 11-1 troubleshooting (page 25-13).

NO – GO TO STEP 3.

3. Speedometer Line Open Circuit Inspection

Disconnect the VS sensor 3P (Black) connector (page 25-30).
Disconnect the combination meter 16P (Gray) connector (page 24-7).

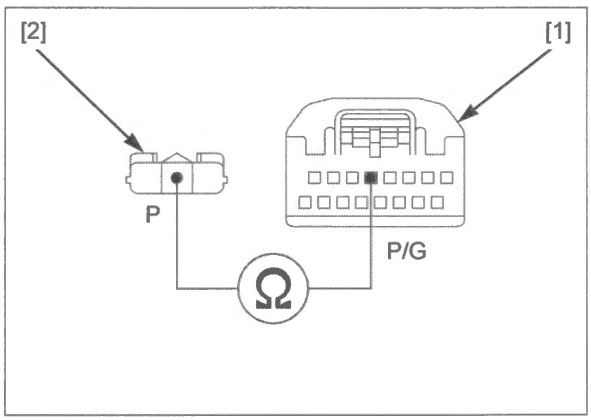
Check the continuity between the wire harness side combination meter 16P (Gray) connector [1] and VS sensor 3P (Black) connector [2] terminals.

Connection: Pink – Pink/green

Is there continuity?

YES – Replace the combination meter (page 24-11).

NO – • Open circuit in the Pink/green or Pink wire.
• Loose or poorly connected related connectors.



REMOVAL/INSTALLATION

Remove the assist headlight cover (page 24-3).

Turn the ignition switch OFF.

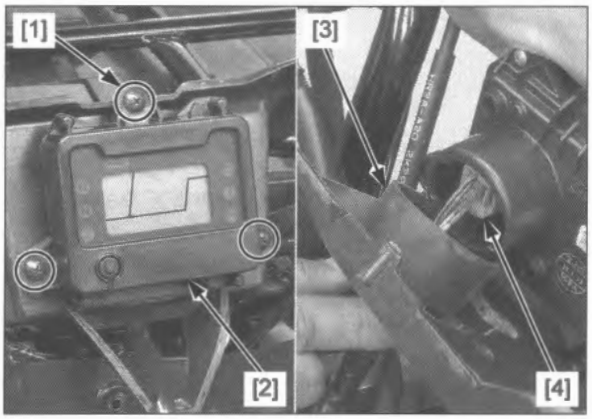
Remove the screw [1] and meter cover [2].



Remove the screws [1] and combination meter [2].
Slide the boot [3] and disconnect the 16P (Gray) connector [4] from the combination meter.

Installation is in the reverse order of removal.

TORQUE:
Combination meter mounting screw:
0.8 N·m (0.1 kgf·m, 0.6 lbf·ft)



CLOCK SET PROCEDURE

Turn the ignition switch ON and select the digital clock mode.

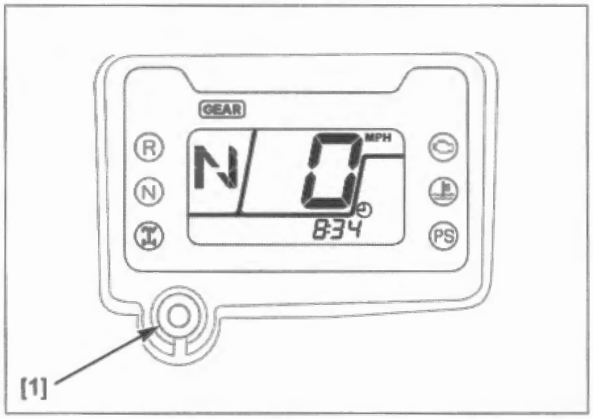
Press and hold the mode select button [1] until the display start blinking.

To advance the display 1 minute at a time, press and release the mode select button for 0.5 seconds.
Press and hold the mode select button and the display will begin advancing faster. Press and hold the button for:

- 0.5 – 5.5 seconds: advance one minute at a time.
- 5.5 – 10.5 seconds: advance five minutes at a time.
- 10.5 seconds or more: advance ten minutes at a time.

Release the mode select button when the display reaches the desired time.

To end the adjustment, press and release the mode select button for less than 0.5 seconds or turn the ignition switch OFF.



ACCESSORY SOCKET

INSPECTION

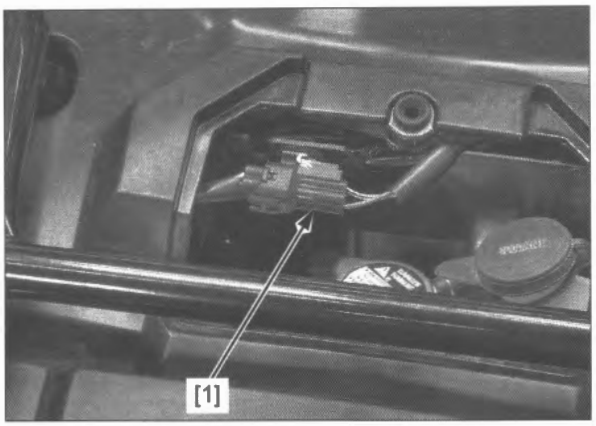
Remove the radiator cap lid (page 2-3).

Remove the accessory socket sub harness 4P (Red) connector [1] from the front connector stay and disconnect it.

Measure the voltage between wire harness side accessory socket 4P (Red) connector terminals.

Connection: White/black (+) – Green (–)

There should be battery voltage with the ignition switch turned ON.
If there is no voltage, check for a blown ACC fuse (20 A) and an open circuit in the wire harness.



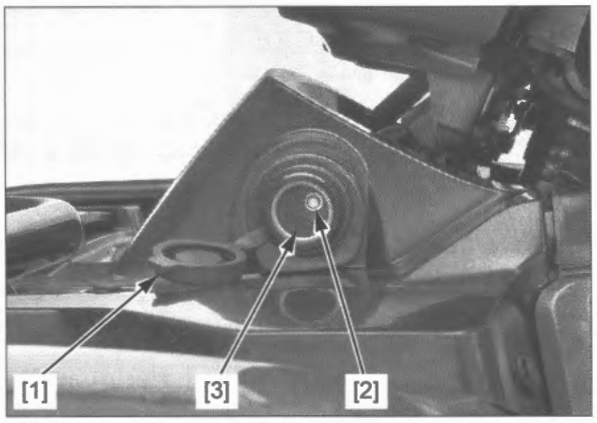
Open the accessory socket cap [1].

Check for continuity between the White/black wire terminal of the accessory socket sub harness 4P (Red) connector and bottom center terminal [2] of the socket, and between the Green wire terminal and side wall terminal [3].

There should be continuity.

If there is no continuity, inspect the accessory socket sub harness.

If the accessory socket sub harness is normal, replace the accessory socket (page 24-12).



REPLACEMENT

Disconnect the accessory socket sub harness 2P (Black) connector [1] from the accessory socket [2].

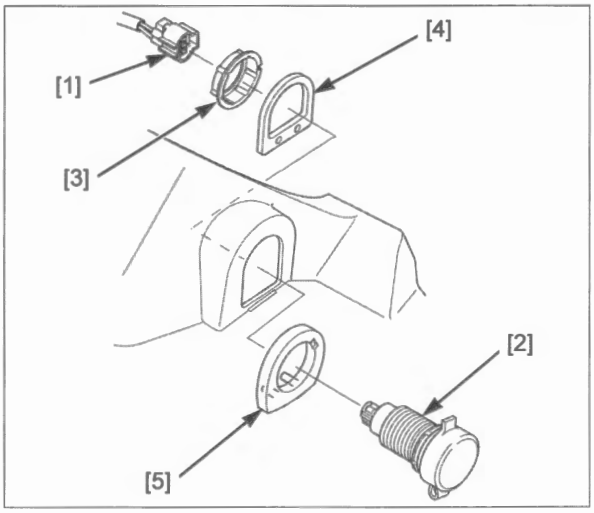
Remove the nut [3] and inner spacer [4], accessory socket, outer spacer [5].

Assemble the outer spacer and a new accessory socket by aligning the groove with the lug, and place them into the front fender.

Install the inner spacer while aligning the holes with the outer spacer bosses.

Install the nut and tighten it securely.

Connect the accessory socket sub harness 2P (Black) connector.



IGNITION SWITCH

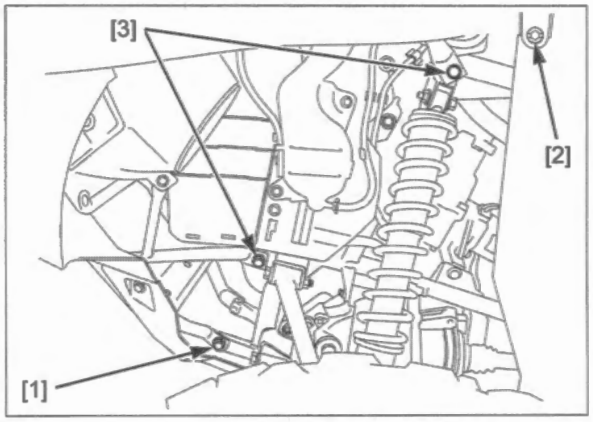
INSPECTION

- Work in a well ventilated area. Smoking or allowing flames or sparks in the work area or where gasoline is stored can cause a fire or explosion.

Remove the tank cover assembly (page 2-4).

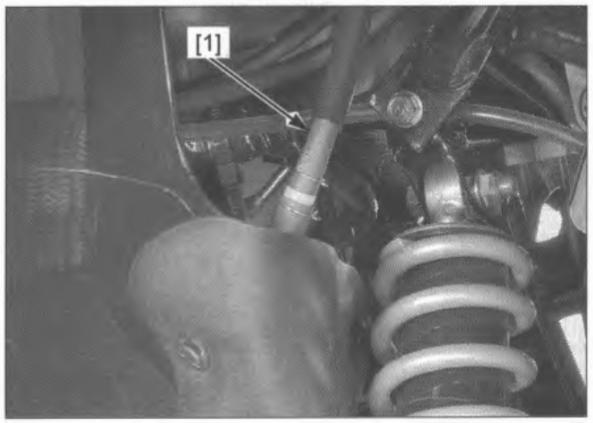
Loosen both side of the lower bolts [1].

Remove the trim clip [2] and bolts [3] from both right and left sides.



AC type only (After '19):

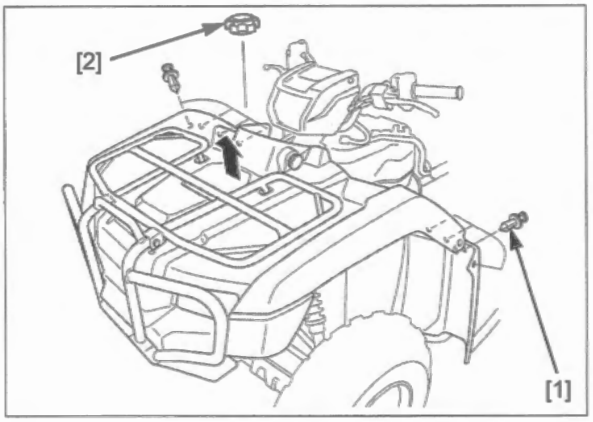
Disconnect the air vent hose [1].



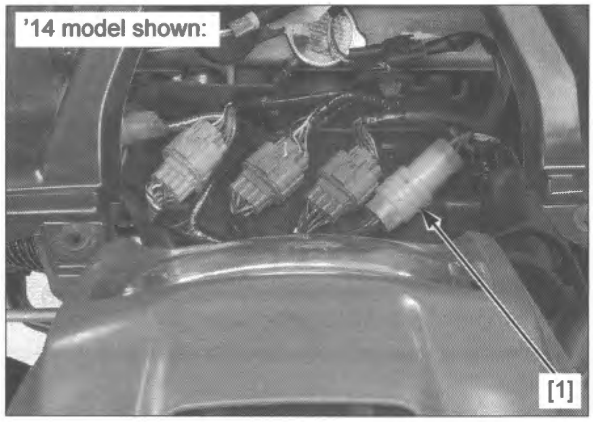
Remove the trim clips [1] from both right and left sides.

Remove the fuel tank cap [2] and lift up the rear side of the front fender slightly.

Install the fuel tank cap.



Remove the ignition switch 4P connector [1] and disconnect it.



Check for continuity between the switch side connector terminals in each switch position according to the chart:

'14 models:
- FM1 (page 27-2)
- FE1 (page 27-6)
- FM2 (page 27-8)
- FE2 (page 27-12)

After '14 models:
- FE1 (page 27-7)
- FM5 (page 27-16)
- FM7 (page 27-17)

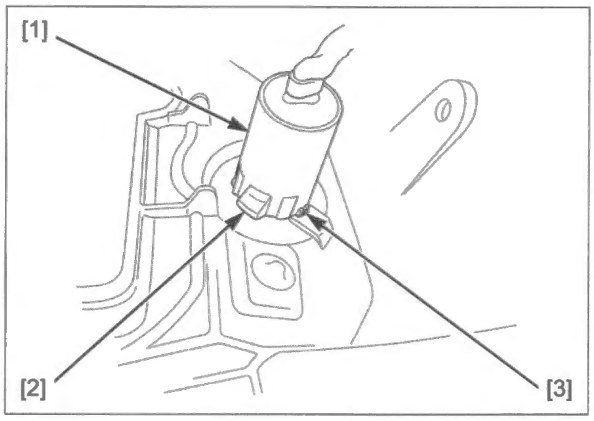
'15 – '19 models:
- FM1 (page 27-3)
- FM2 (page 27-9)
- FE2 (page 27-13)
- FM6 (page 27-17)
- FA5 (page 27-18)
- FA6/FA7 (page 27-22)

After '19 models:
- FM1 (page 27-4)
- FM2 (page 27-10)
- FE2 (page 27-14)
- FM6 (page 27-10)
- FA5 (page 27-19)
- FA6/FA7 (page 27-23)

REPLACEMENT

Disconnect the ignition switch 4P connector (page 24-13).
Remove the meter cover (page 24-11).

Remove the ignition switch [1] from the meter cover by pushing in the two stoppers [2].



Install a new ignition switch by aligning the locating tab [3] with the cover groove.

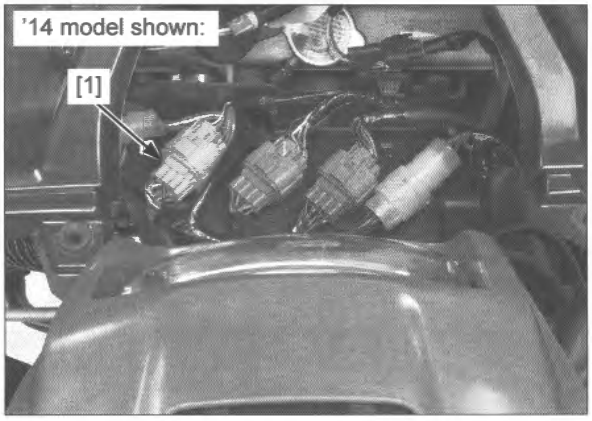
Install the removed parts in the reverse order of removal.

LEFT HANDLEBAR SWITCH

INSPECTION

- For right handlebar switch inspection (page 21-23).

Lift the front fender (page 24-13).



Remove and disconnect the left handlebar switch (FM1/FM2/FE1/FE2: Green, FM5/FM6/FM7/FA5/FA6/FA7: Gray) connector [1].

– FE/FA models: 14P
– FM models: 8P

Check for continuity between the switch side connector terminals in each switch position according to the chart:

'14 models:
– FM1 (page 27-2)
– FE1 (page 27-6)
– FM2 (page 27-8)
– FE2 (page 27-12)

After '14 models:
– FE1 (page 27-7)
– FM5 (page 27-16)
– FM7 (page 27-17)

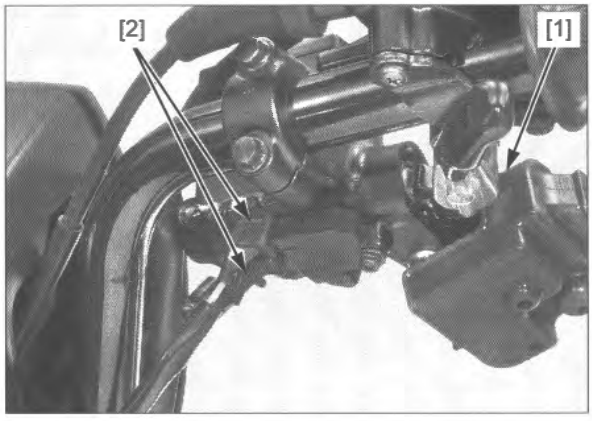
'15 – '19 models:
– FM1 (page 27-3)
– FM2 (page 27-9)
– FE2 (page 27-13)
– FM6 (page 27-17)
– FA5 (page 27-18)
– FA6/FA7 (page 27-22)

After '19 models:
– FM1 (page 27-4)
– FM2 (page 27-10)
– FE2 (page 27-14)
– FM6 (page 27-10)
– FA5 (page 27-19)
– FA6/FA7 (page 27-23)

FRONT BRAKE INHIBITOR SWITCH

INSPECTION

Slide the dust cover [1] and disconnect the front brake inhibitor switch wire connectors [2].



Check for continuity between the switch terminals.

There should be continuity with the front brake lever squeezed and no continuity with the lever released.

REPLACEMENT

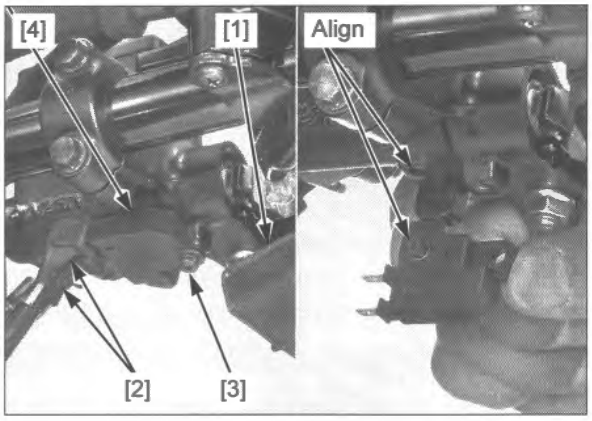
Slide the dust cover [1] and disconnect the front brake inhibitor switch wire connectors [2].

Squeeze the front brake lever and secure it.
Remove the screw [3] and front brake inhibitor switch [4].

Installation is in the reverse order of removal.

- Align the switch boss with the hole of the master cylinder.

TORQUE:
Front brake inhibitor switch screw:
1.2 N·m (0.1 kgf·m, 0.9 lbf·ft)

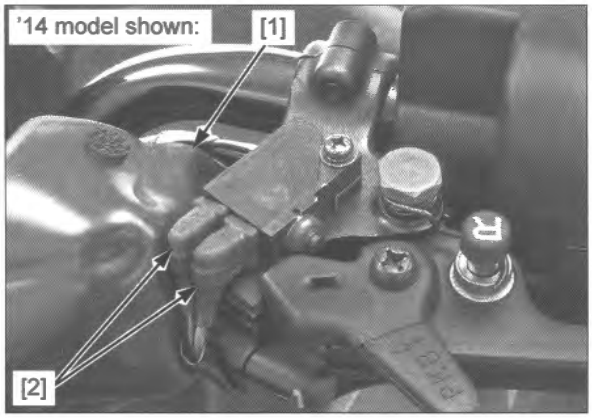


REAR BRAKE LIGHT SWITCH

LEVER SWITCH INSPECTION

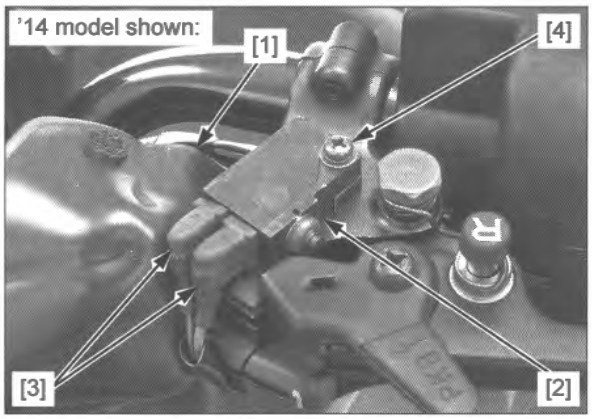
Remove the dust cover [1] from the rear brake light switch.
Disconnect the rear brake light switch wire connectors [2] and check for continuity between the switch terminals.

There should be continuity with the rear brake lever squeezed and no continuity with the lever released.



LEVER SWITCH REPLACEMENT

Remove the dust cover [1] from the rear brake light switch [2].
Disconnect the rear brake light switch wire connectors [3].
Remove the screw [4] and switch from the brake lever bracket.



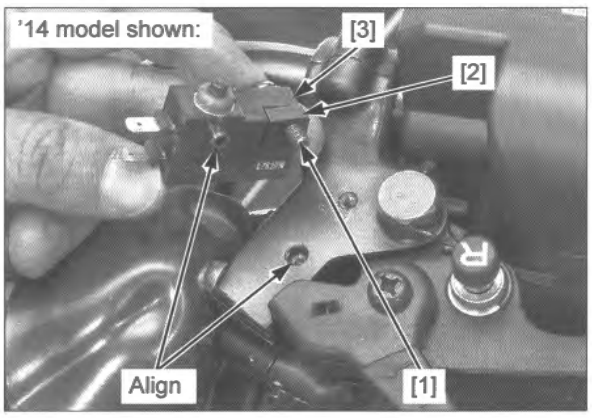
Install the screw [1] and spacer [2] onto the rear brake lever switch [3].

Install the switch onto the brake lever bracket by aligning the boss with the hole.

Tighten the screw to the specified torque.

TORQUE: 1.2 N·m (0.1 kgf·m, 0.9 lbf·ft)

Connect the wire connectors to the switch.
Install the dust cover onto the switch properly.

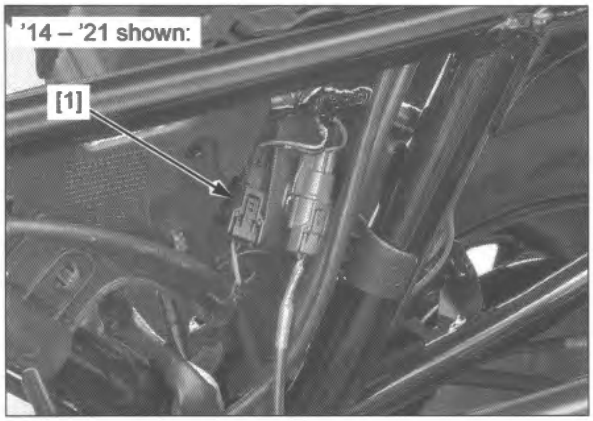


PEDAL SWITCH INSPECTION

Remove the air cleaner housing (page 7-18).

Disconnect the rear brake light switch 2P (Black) connector [1] and check for continuity between the switch side connector terminals.

There should be continuity with the rear brake pedal depressed and no continuity with the pedal released.



GEAR POSITION SWITCH ('14 – '19 FE/ FM models)

INSPECTION

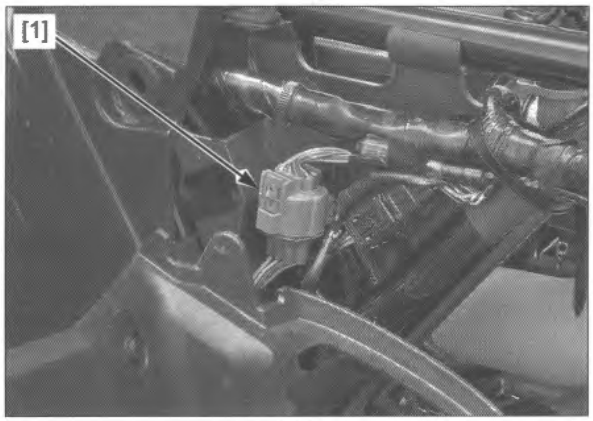
Remove the tank cover assembly (page 2-4).

Remove the gear position switch 8P connector [1] from the side connector stay and disconnect it.

If the transmission will not shift with the gearshift switches, use the gear change tool included with the tool kit (FE models).

Check for continuity at the switch side connector terminals.
There should be continuity in each gear position as follows:

Gear position	Connection
Reverse	Gray – ground
Neutral	Light green/red – ground
1st	White/green – ground
2nd	White/red – ground
3rd	Blue – ground
4th	Yellow – ground
5th	Light blue/white – ground



REPLACEMENT

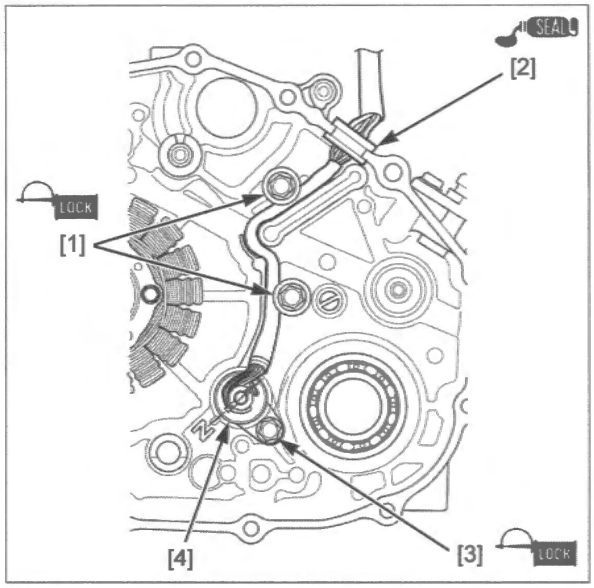
Remove the rear crankcase cover (page 15-8).

Remove the two wire clamp bolts [1].
Remove the wire grommet [2] from the rear crankcase cover.
Remove the retaining bolt [3] and gear position switch [4] from the rear crankcase cover.

Apply locking agent to all the bolt threads (page 1-17).
Install a new gear position switch onto the rear crankcase cover and tighten the retaining bolt.
Apply liquid sealant to the grommet seating surface.
Route the wire as shown and install the grommet into the crankcase cover groove properly.
Install the two wire clamp bolts and tighten them to the specified torque.

TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)

Install the rear crankcase cover (page 15-14).



COOLING FAN

Cooling fan does not start

1. **Fuse Inspection**

   Check the following:

   – FM1/FM2: FAN fuse (20 A)
   – FE1/FE2: ES fuse (30 A)

   Is the fuse blown?

   YES – Replace the FAN fuse or ES fuse.

   NO – GO TO STEP 2.

2. **PGM-FI System DTC Inspection**

   Check the PGM-FI system DTC (page 4-13).

   Is DTC 7-1 and/or 7-2 indicated?

   YES – • Perform the DTC 7-1 troubleshooting (page 4-23).
   • Perform the DTC 7-2 troubleshooting (page 4-24).

   NO – GO TO STEP 3.

3. **Ground Line Inspection**

   Disconnect the PCM/ECM 5P (Black) connector (page 4-45).

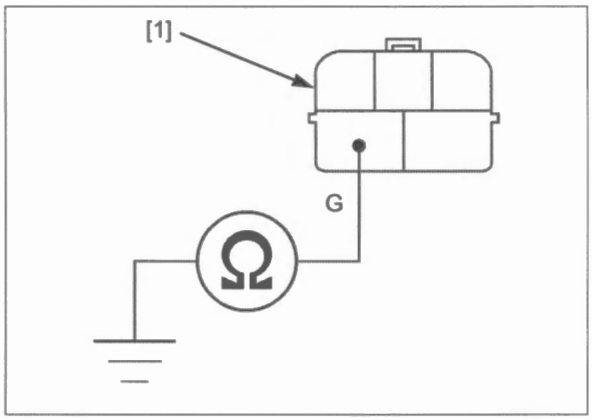
   Check for continuity between the wire harness side PCM/ECM 5P (Black) connector [1] terminal and ground.

   Connection: Green – ground

   Is there continuity?

   YES – GO TO STEP 4.

   NO – Open circuit in the Green wire.



4. **Cooling Fan Operation Inspection**

   Connect the wire harness side PCM/ECM 5P (Black) connector [1] terminals with jumper wire [2].

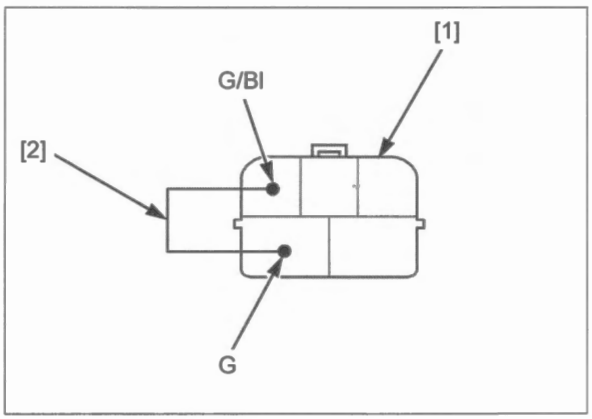
   Connection: Green/black – green

   Check the cooling fan when connecting the jumper wire.

   Does the cooling fan start?

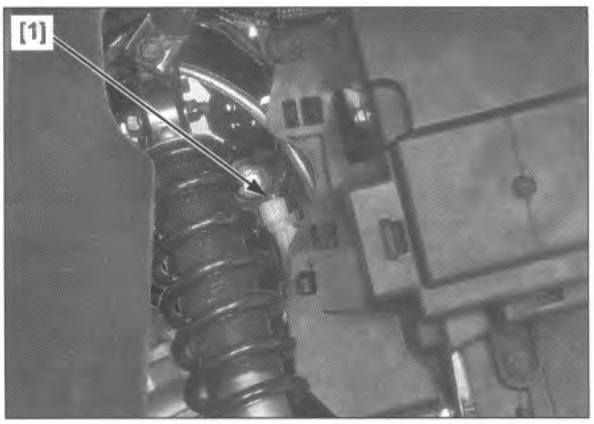
   YES – Replace the PCM/ECM with a known good one, and recheck.

   NO – GO TO STEP 5.



5. Cooling Fan Ground Line Inspection

Disconnect the cooling fan 2P connector [1] from the fan motor stay and disconnect it.



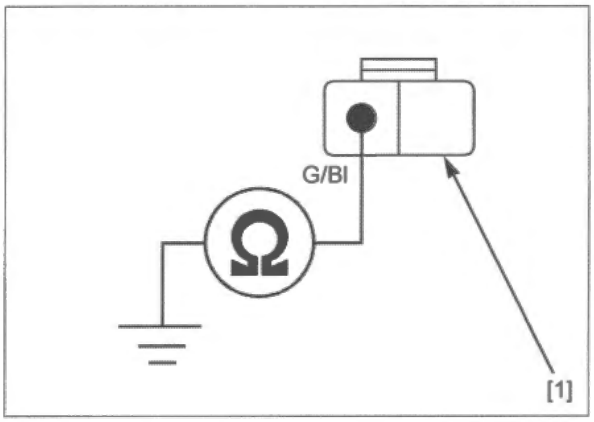
With the jumper wire connected to the PCM/ECM 5P (Black) connector, check for continuity between the wire harness side fan motor 2P connector [1] terminal and ground.

Connection: Green/black – ground

Is there continuity?

YES – GO TO STEP 6.

NO – Open circuit in the Green/black wire.



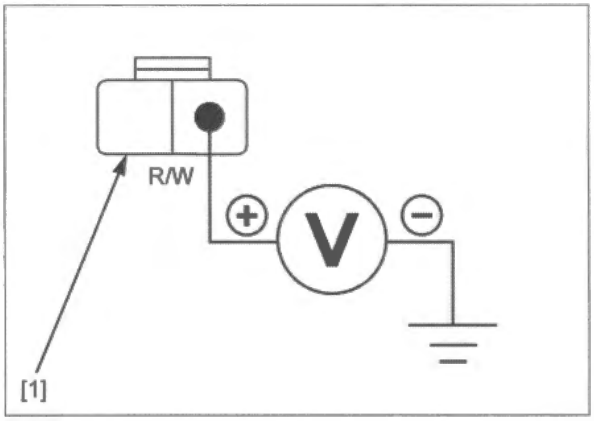
6. Cooling Fan Power Input Line Inspection

Measure the voltage between the wire harness side fan motor 2P connector [1] terminal (+) and ground (–).

Is there battery voltage?

YES – Replace the cooling fan with a new one (page 8-7).

NO – Open circuit in the Red/white wire between the cooling fan and fuse box.



FUEL GAUGE/FUEL LEVEL SENSOR

SYSTEM INSPECTION

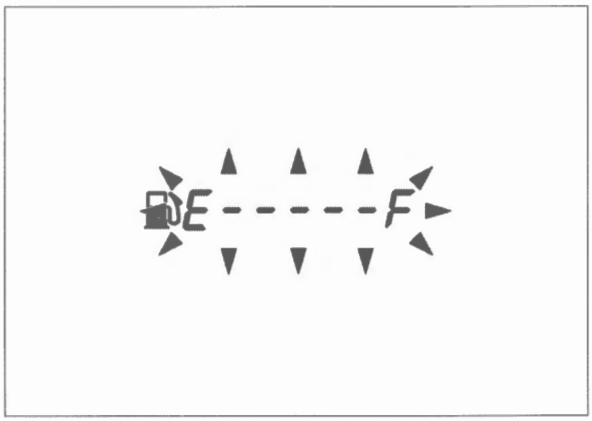
Check that the speedometer and indicators function properly.

- If they do not function, check the combination meter (page 24-7).
- If they function, check as follows:

Turn the ignition switch ON and check the fuel gauge.

If "E-----F" blinks, check for open or short circuit in Green/yellow and/or Yellow/white wire between the fuel pump unit and combination meter.

If the wires are normal, replace the combination meter (page 24-11).



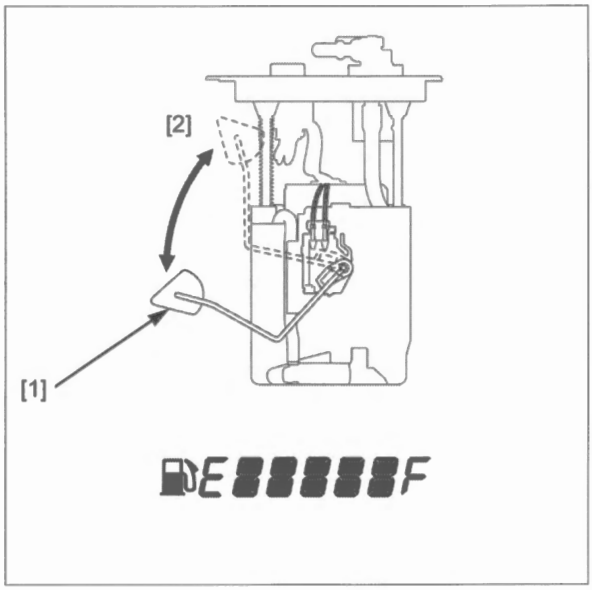
Remove the fuel pump unit (page 7-14).

Connect the fuel pump unit 4P (Gray) connector.

With the fuel level sensor float [1] at the top (FULL) position [2], turn the ignition switch ON and check the fuel gauge.

All segments up to segment "F" [1] should come on.

Turn the ignition switch OFF.



Move the float to the bottom (RESERVE) position, turn the ignition switch ON and check the fuel gauge.

"E_____F" and "LOW FUEL" should blink alternately.

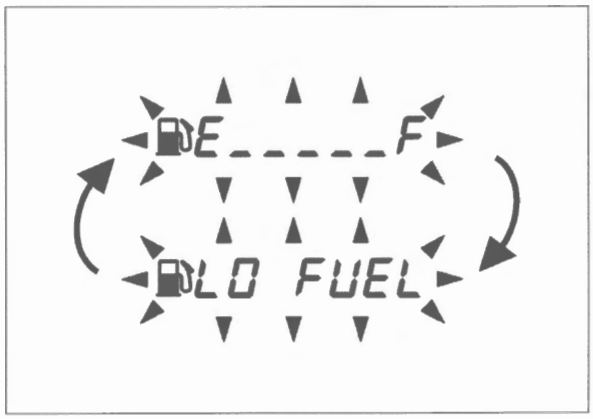
If the fuel gauge does not function properly, check the fuel level sensor (page 24-21).

If the fuel level sensor is OK, replace the combination meter.

If all segments blink during inspection, replace the combination meter (page 24-11).

Turn the ignition switch OFF.

Install the fuel pump unit (page 7-14).



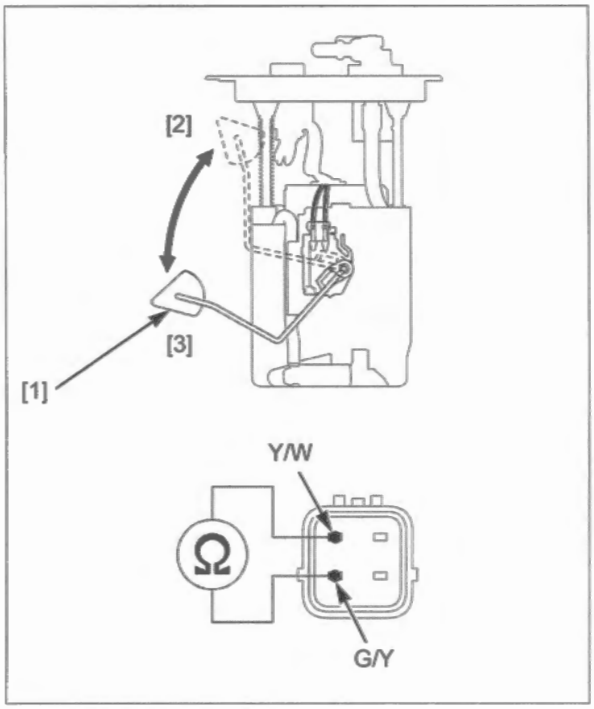
FUEL LEVEL SENSOR INSPECTION

Remove the fuel pump unit (page 7-14).

Measure the fuel level sensor resistance with the float [1] at the top (FULL) [2] and bottom (RESERVE) [3] positions.

Connection: Green/yellow – Yellow/white

FLOAT POSITION	RESISTANCE (20°C/68°F)
TOP (FULL)	19 – 21 Ω
BOTTOM (RESERVE)	772 – 788 Ω

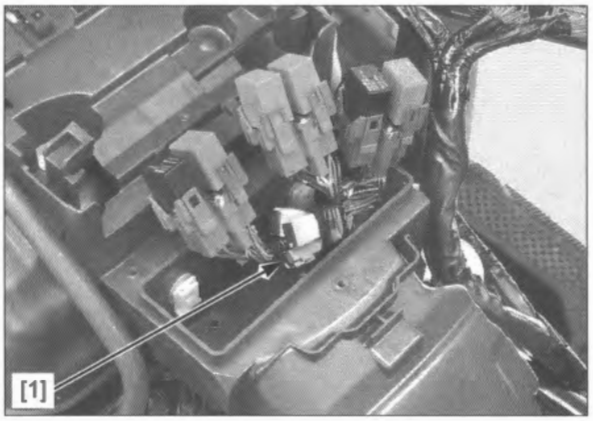


DIODE

Remove the relay box lid (page 6-11).

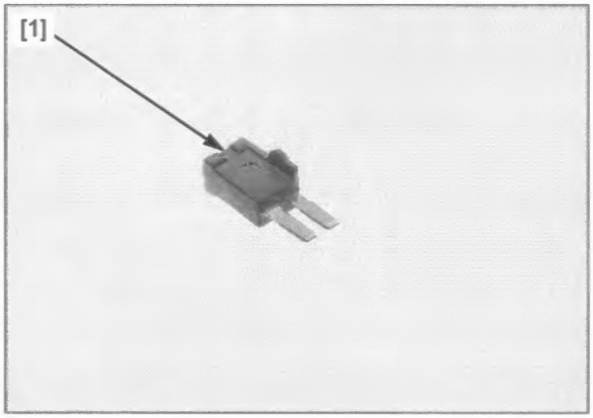
Turn the ignition switch OFF.

Remove the diode (Yellow/red, Green/yellow) [1].



Check for continuity between the terminals of the diode [1].

When there is continuity, a small resistance value will register.
If there is continuity in one direction, the diode is normal.



MEMO

25. ELECTRIC SHIFT PROGRAM (ESP: FE models)

SERVICE INFORMATION 25-2

ESP COMPONENT LOCATION 25-3

ESP SYSTEM DIAGRAM 25-5

BEFORE TROUBLESHOOTING 25-7

SYMPTOM TROUBLESHOOTING 25-7

ELECTRIC SHIFT DOES NOT OPERATE 25-8

ESP TROUBLESHOOTING INFORMATION 25-9

ESP DTC INDEX 25-11

DTC TROUBLESHOOTING 25-13

VS SENSOR 25-30

SHIFT SPINDLE ANGLE SENSOR 25-30

TR SENSOR (After '19) 25-32

NEUTRAL SWITCH (After '19) 25-33

SHIFT CONTROL MOTOR/REDUCTION GEARS 25-33

SERVICE INFORMATION

GENERAL

- Refer to "Before Troubleshooting" first and begin the troubleshooting (page 25-7).
- When performing the DTC troubleshooting, read "ESP Troubleshooting Information" carefully, and inspect and troubleshoot according to the DTC. Observe each step of the procedures one by one. Note the DTC and probable faulty part before starting diagnosis and troubleshooting.
- The PCM may be damaged if dropped. Also, if the connector is disconnected when current is flowing, the excessive voltage may damage the PCM. Always turn off the ignition switch before disconnecting or connecting the connectors.
- Use a digital tester for ESP system inspection.
- The following color codes are used throughout this section.

Bl = Black	Bu = Blue	Gr = Gray	O = Orange	R = Red	W = White
Br = Brown	G = Green	Lg = Light green	P = Pink	Lb = Light blue	Y = Yellow
V = Violet					

For ESP Troubleshooting

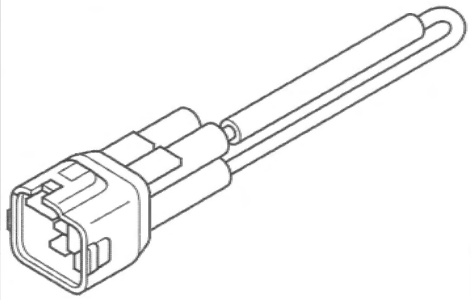
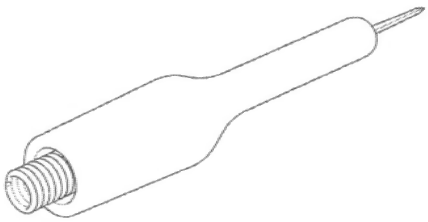
The PCM controls the PGM-FI and ESP systems. Therefore some detection items are shared by the PGM-FI and ESP and they may affect the operation of both systems.

Before starting any troubleshooting, check the items as follows and refer to the appropriate troubleshooting.

1. MIL blinks or DTC for the PGM-FI system (page 4-12).
2. Gear position indicator blinks or DTC for the ESP (page 25-9).
3. Symptom of the ESP operation (page 25-7).

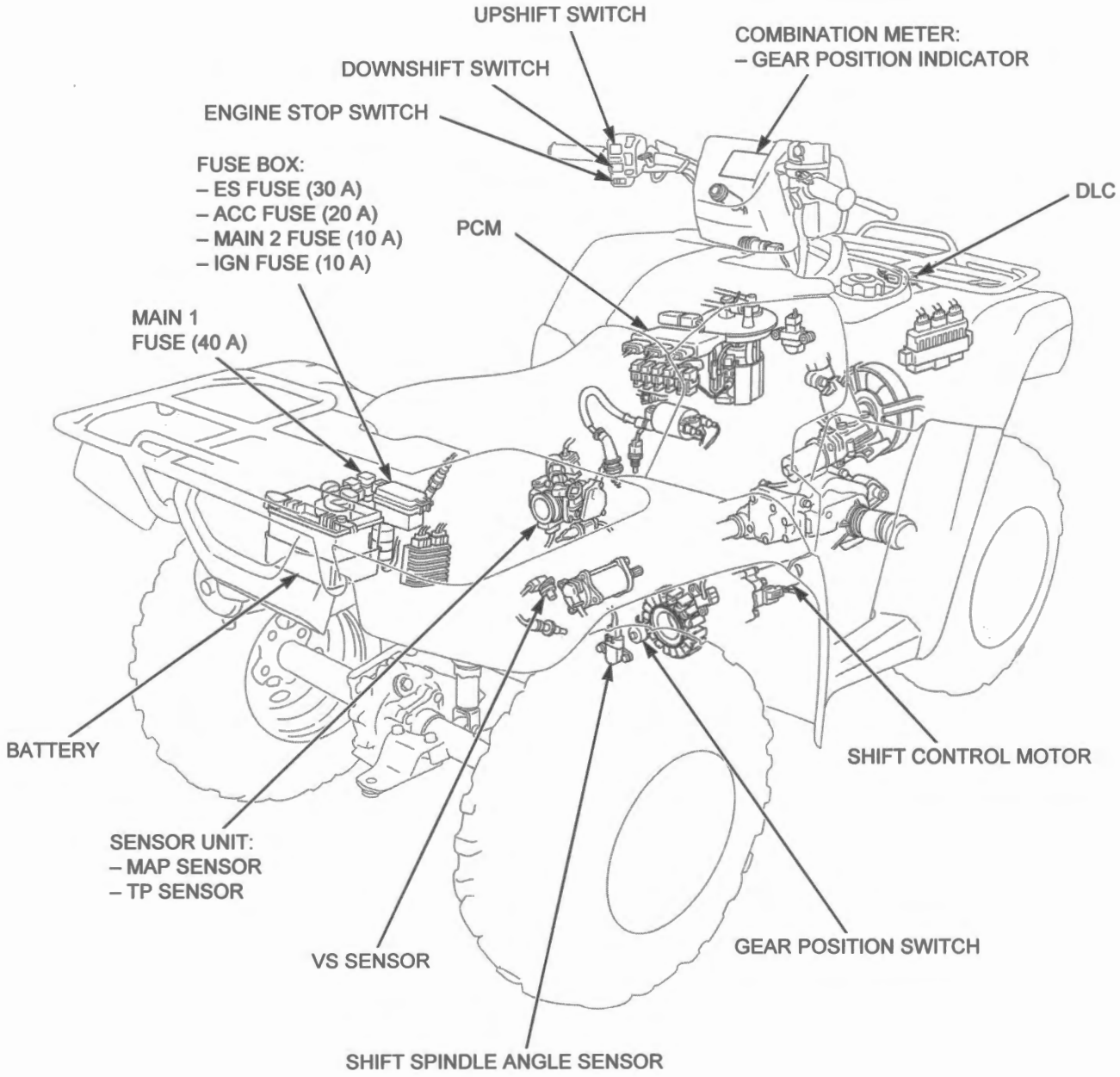
Refer to "General Troubleshooting" information in "PGM-FI system" (page 4-12).

TOOLS

SCS Service Connector 070PZ-ZY30100	Pin Probe Male (2 pack) 07ZAJ-RDJA110
	

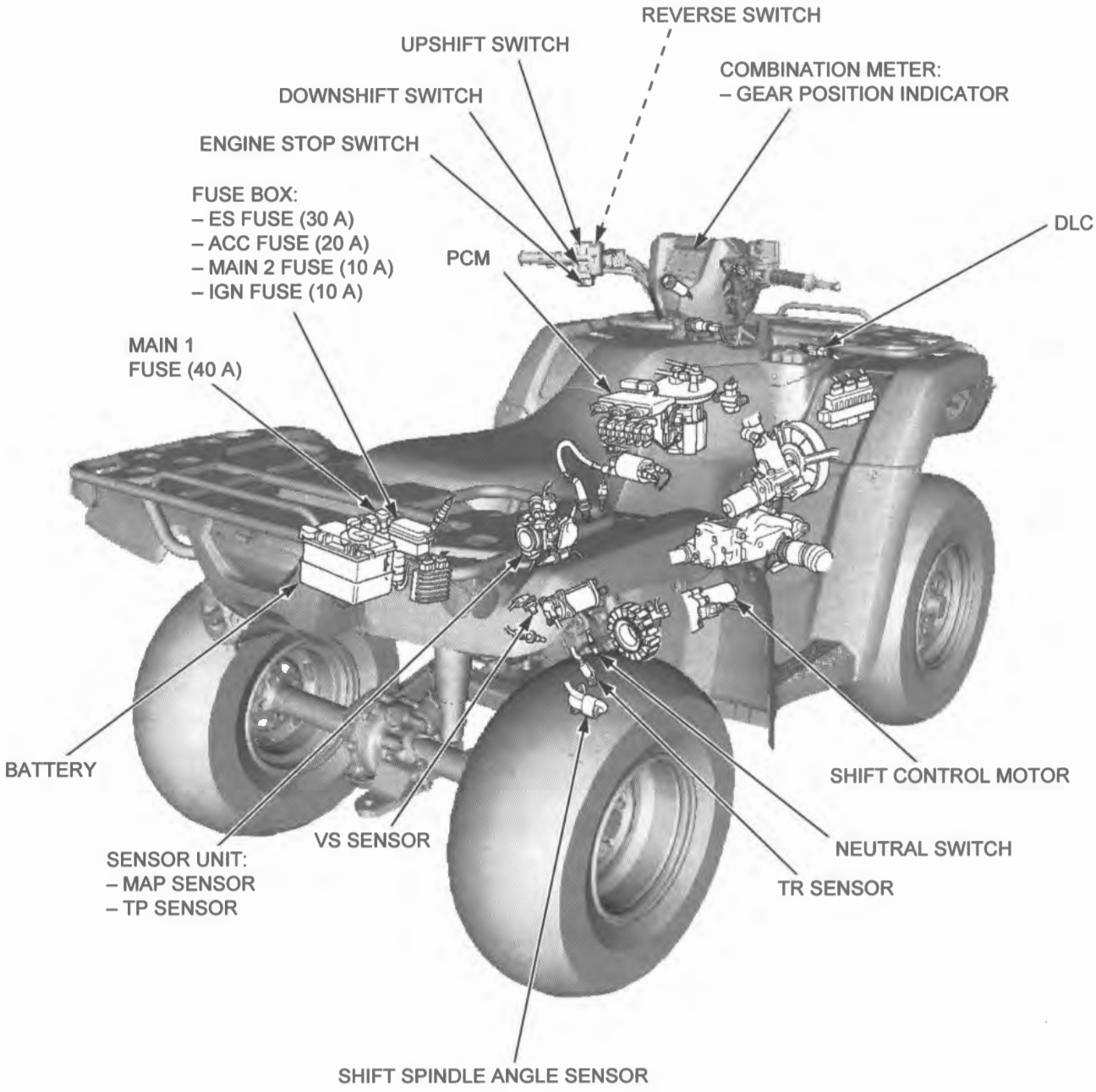
ESP COMPONENT LOCATION

'14 – '19:



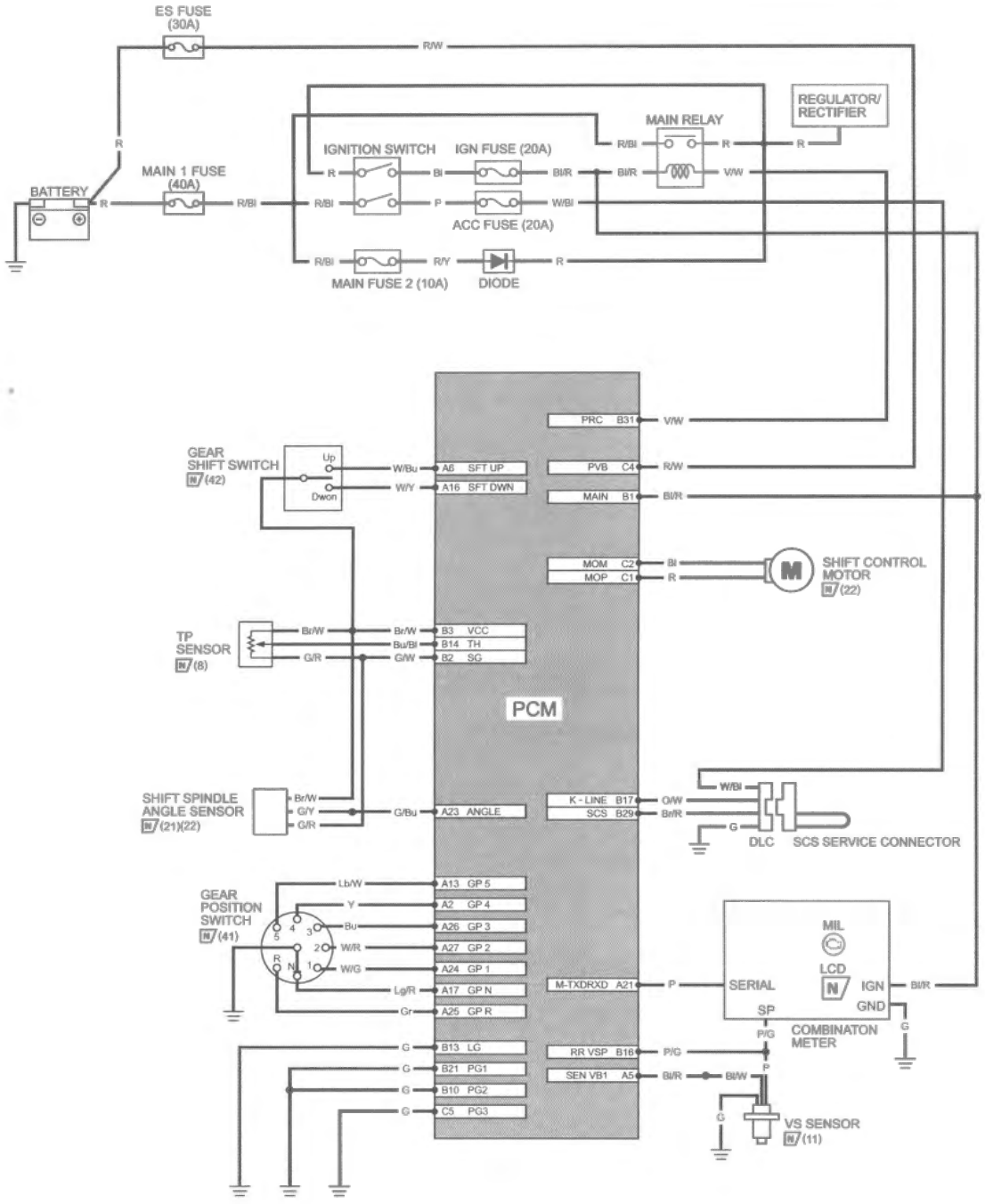
After '19:

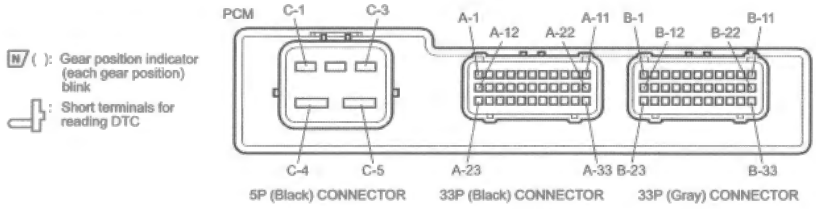
'20 — '21 models shown:



ESP SYSTEM DIAGRAM

'14 – '19:

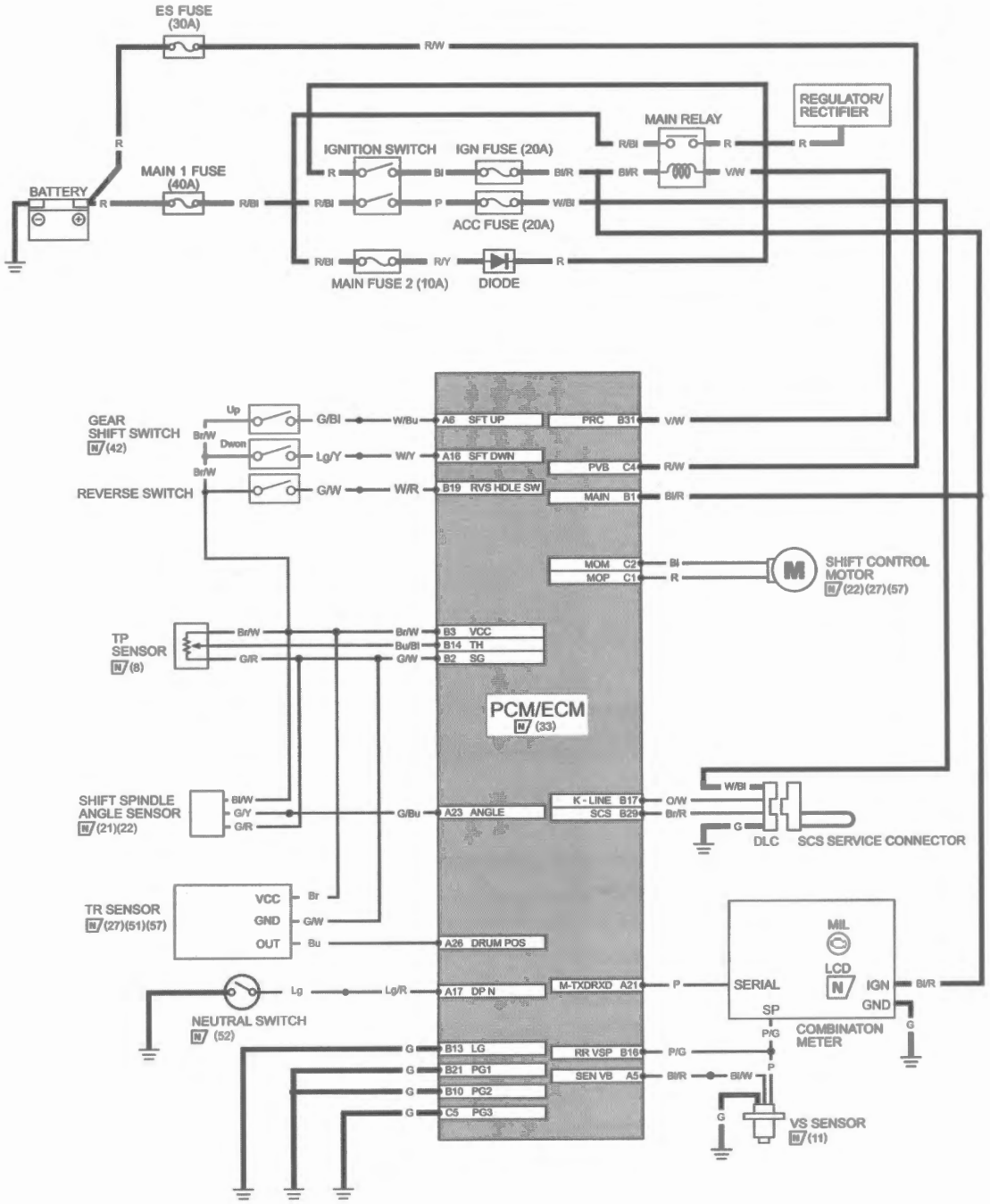


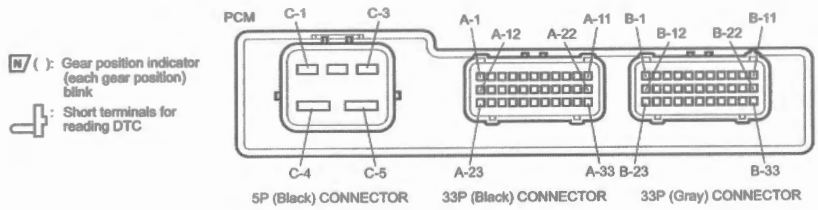


N/( ): Gear position indicator (each gear position) blink

: Short terminals for reading DTC

After '19:


ES FUSE (30A)
R/W
REGULATOR/ RECTIFIER
MAIN RELAY
IGNITION SWITCH
IGN FUSE (20A)
MAIN 1 FUSE (40A)
BATTERY
ACC FUSE (20A)
MAIN FUSE 2 (10A)
DIODE
GEAR SHIFT SWITCH
REVERSE SWITCH
SHIFT CONTROL MOTOR
TP SENSOR
PCM/ECM
SHIFT SPINDLE ANGLE SENSOR
DLC
SCS SERVICE CONNECTOR
TR SENSOR
NEUTRAL SWITCH
MIL
LCD
SERIAL
IGN
GND
COMBINATON METER
VS SENSOR
A8 SFT UP
A16 SFT DWN
B19 RVS HDLE SW
PRC B31
PVB C4
MAIN B1
MOM C2
MOP C1
B3 VCC
B14 TH
B2 SG
A23 ANGLE
K - LINE B17
SCS B29
A26 DRUM POS
A17 DP N
M-TXDRXD A21
RR VSP B16
SEN VB A5
B13 LG
B21 PG1
B10 PG2
C5 PG3


PCM
C-1
C-3
A-1
A-12
A-22
A-11
B-1
B-12
B-22
B-11
C-4
C-5
A-23
A-33
B-23
B-33
5P (Black) CONNECTOR
33P (Black) CONNECTOR
33P (Gray) CONNECTOR
( ): Gear position indicator (each gear position) blink
: Short terminals for reading DTC

BEFORE TROUBLESHOOTING

NOTE:

- If the ATV has any ESP trouble, the gear position indicator blinks to indicate the DTC (Diagnostic Trouble Code) (page 25-9). Check the DTC and refer to the DTC index and begin the appropriate troubleshooting procedure (page 25-11).
- If there are no DTC stored in the PCM memory, do the troubleshooting as "Symptom Troubleshooting" (page 25-7).

VERIFY THE COMPLAINT

- Check the accuracy of the customer complaint by test riding the ATV.
- Note the symptoms.
- Do not begin disassembly or testing until you have determined if the problem is electrical or mechanical by shifting the gears manually (page 25-8).
- Temporary failures can occur. Under certain conditions, the ESP system can "miss a shift." When this happens, the PCM may record a DTC. Be sure to note and erase any stored DTC(s) when verifying the customer's complaint. If the customer's complaint is duplicated during the test-ride, and the blinking gear position indicator displays a DTC, proceed with troubleshooting.

PRELIMINARY ESP SYSTEM INSPECTION

Inspect the following before diagnosing the system.

- Make sure the battery is fully charged and in good condition (page 23-5)
- Make sure the clutch is adjusted properly (page 3-29)
- Check for a blown MAIN 1 fuse (40 A), MAIN 2 fuse (10 A), or IGN fuse (20 A)

SYMPTOM TROUBLESHOOTING

Symptom	Diagnosis	Also check for
Shift control failure, but no DTC set	Troubleshoot the "Electric Shift Does Not Operate" (page 25-8)	clutch adjustment (page 3-29)
Gear position indicator blinks "–" constantly (No DTC set)	Inspect the serial communication line (page 24-9)	–
Gear position indicator is no indication and MIL stays on, but no DTC is set	Inspect the DLC circuit (page 4-40)	Short circuit in the DLC related wire

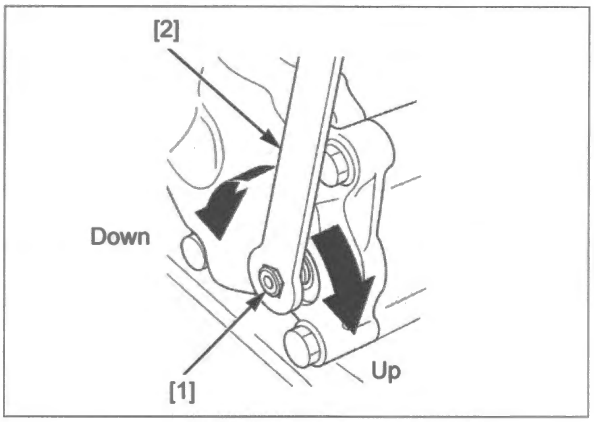
ELECTRIC SHIFT DOES NOT OPERATE

DTC 23-1 will be indicated with the ignition switch turned ON.

1. Shifting Operation Check

Remove the tank cover assembly (page 2-4).
Turn the ignition switch OFF.

Manually shift the transmission by rotating the gearshift spindle [1] with the emergency gear change tool [2].



Can the gears be changed manually?

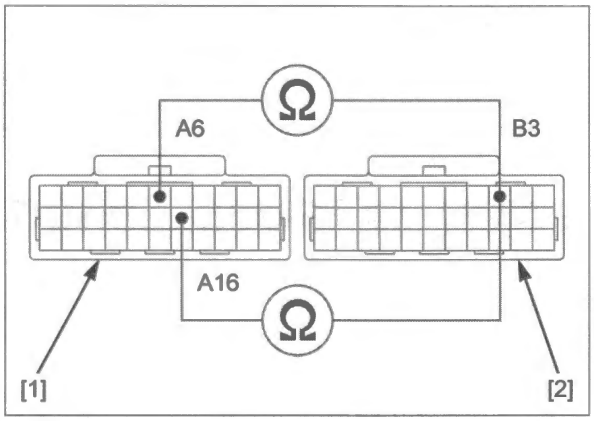
YES – GO TO STEP 2.

NO – Check the gearshift linkage (page 12-18) and the transmission (page 16-7).

2. Gearshift Switch Inspection at PCM Connector

Disconnect the PCM 33P connectors (page 4-45).

Check for continuity between the wire harness side PCM 33P (Black) connector [1] and PCM 33P (Gray) connector [2] terminals while pushing the gearshift switch.



TOOL:
Pin Probe Male (2 pack) **07ZAJ-RDJA110**

Connection:
With the upshift switch pushed:
B3 – A6
With the downshift switch pushed:
B3 – A16

Is there continuity?

YES – Loose or poor contact of the PCM 33P (Black) connector.

NO – GO TO STEP 3.

3. Gearshift Switch Inspection

Check the left handlebar switch (page 24-15).

Is the gearshift switch normal?

YES – • Open circuit in the following wire between the handlebar switch 14P ('14 model: Green, After '14 model: Gray) connector and PCM 33P (Black) connector.
– Brown/white or White/blue
– Brown/white or White/yellow

NO – Faulty gearshift switch.

ESP TROUBLESHOOTING INFORMATION

GENERAL TROUBLESHOOTING

- Refer to "GENERAL TROUBLESHOOTING" in "PGM-FI system" (page 4-12).

SYSTEM DESCRIPTION

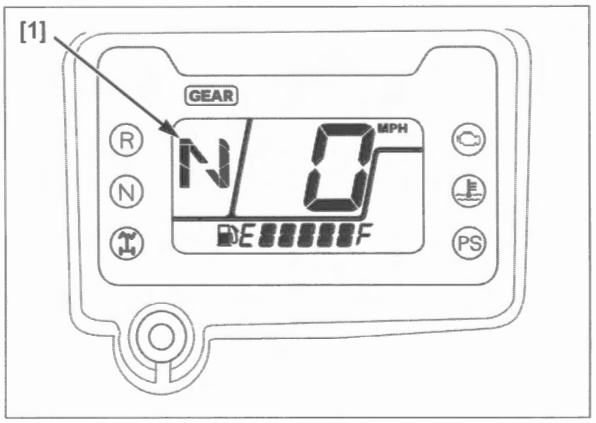
SELF-DIAGNOSIS SYSTEM

The PCM controls the PGM-FI and ESP systems. Therefore, some detection items are shared by the PGM-FI and ESP and they may affect the operation of both systems.

The ESP system is equipped with the self-diagnostic system. If the PCM detects an ESP failure, it stops the system function and turns on the gear position indicator [1] blinking in failed gear position to indicate the DTC, and stores a DTC in its erasable memory for the relevant system failure.

To reset the ESP system, turn the ignition switch from ON to OFF and back to ON again. However, if the PCM still detects a problem, it will continue to stop the ESP system function. When this occurs, the gear position indicator will blink a certain number of times to indicate the DTC.

To indicate the DTC, the gear position indicator blinks each gear position; depending on the kind of trouble.



DTC (Diagnostic Trouble Code)

Refer to PGM-FI System section for DTC information (page 4-12).

INDICATOR BLINKING PATTERN

- The number of indicator blinks is the equivalent of the main code of the DTC (the sub code cannot be displayed by the indicator blinking).
- The indicator has two types of blinks, a long blink and short blink. The long blink lasts for 1.2 seconds, the short blink lasts for 0.4 seconds. One long blink is the equivalent of ten short blinks. For example, when two long blinks are followed by three short blinks, the DTC is 23 (two long blink = 20 blinks, plus three short blinks).
- When the PCM stores more than one DTC, the indicator displays in the order from the lowest number to highest number.

CURRENT DTC/STORED DTC

The DTC is indicated in two ways according to the failure status.

- If the PCM detects the problem at present, the gear position indicator will blink at all times. It is possible to readout the indicator blink pattern as the current DTC.
- If the PCM does not detect any problem at present but has a problem stored in its memory, the indicator will not blink. If it is necessary to retrieve the past problem, readout the stored DTC by following the DTC readout procedure.

MCS INFORMATION

- Refer to "MCS INFORMATION" in "PGM-FI system" (page 4-13).

DTC READOUT

- If the MIL blinks, refer to "PGM-FI Troubleshooting Information" and troubleshoot the PGM-FI system first. Then recheck the ESP after erasing the PGM-FI DTC.
- After performing diagnostic troubleshooting, erase the problem DTC(s) (page 25-10) and test-ride the vehicle to be sure that the problem(s) have been removed.

Connect the MCS to the DLC (page 4-13).

Read the DTC, stored data and follow the troubleshooting index (page 25-11).

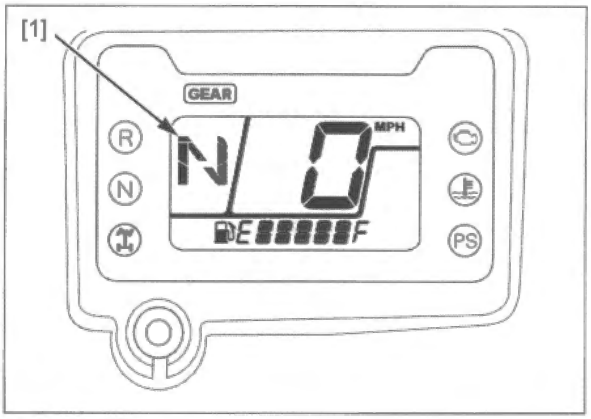
To read the DTC without the MCS, refer to the following procedure.

Reading DTC with the gear position indicator

Turn the ignition switch ON, read and note the gear position indicator [1] blinks.

The number of blinks indicates the current DTC.

Refer to the troubleshooting index (page 25-11).



When retrieving the stored DTC, refer to the following procedures.

1. Disconnect the DLC (page 4-13).
2. Short the DLC [1] terminals using the special tool.

   TOOL:
   [2] SCS service connector 070PZ-ZY30100

   Connection: Brown/red – Green

3. Turn the ignition switch ON, read and note the gear position indicator blinks.

   The number of blinks indicates the stored DTC.

   Refer to the troubleshooting index (page 25-11).



ERASING DTC

NOTE:

- When erasing the ESP DTC as follows, the PGM-FI DTC and differential lock DTC would also be erased at the same time, check the MIL and differential lock indicator blinks and troubleshoot the PGM-FI and differential lock system before readout/ erasing the ESP DTC.

Connect the MCS to the DLC (page 4-13).

Erase the DTC with the MCS while the engine is stopped.

To erase the DTC without MCS, refer to the following procedure.

How to erase the DTC without MCS

1. Disconnect the DLC (page 4-13).
2. Short the DLC [1] terminals using the special tool.

   TOOL:
   [2] SCS service connector 070PZ-ZY30100

   Connection: Brown/red – Green

3. Turn the ignition switch ON.
4. Remove the special tool from the DLC.
5. The gear position indicator will show each gear position for approximately 5 seconds. While the gear position indicator shows each gear position, short the DLC terminals again with the special tool. The self-diagnostic memory is erased if the gear position indicator goes off and starts blinking.



NOTE:

- The DLC must be shorted while the indicator shows each gear position. If not, the indicator will not start blinking.
- Note that the self-diagnostic memory cannot be erased if the ignition switch is turned OFF before the indicator starts blinking.

CIRCUIT INSPECTION

- Refer to "INSPECTION AT PCM/ECM CONNECTOR" information in "PGM-FI system" (page 4-14).

ESP DTC INDEX

'14 – '19

NOTE:

- When the gear position indicator "–" is blinking constantly (and the MIL and coolant temperature indicator lights are dark), but no DTC is indicated or retrievable, check the serial communication line (page 24-9).
- There are some DTCs (21-1 thru 23-1) related to the shift spindle angle sensor circuit that have different conditions of malfunction detection. In case of the low voltage (about 0 V) or high voltage (about 5 V) in the shift spindle angle sensor circuit, DTC 22-2 will be indicated when the control motor does not operate.
- If not using the MCS, perform all inspections according to the relevant main code.

DTC	Function Failure	Symptom/Fail-safe function	Refer to
8-1	TP sensor circuit Low voltage (less than 0.107 V) • TP sensor or its circuit malfunction	• Poor engine acceleration • Pre-program value: 0° • ESP does not work	4-25
8-2	TP sensor circuit High voltage (more than 4.981 V) • Loose or poor contact of the TP sensor connector • TP sensor or its circuit malfunction	• Poor engine acceleration • Pre-program value: 0° • ESP does not work	4-27
11-1	VS sensor no signal • Loose or poor contact of the VS sensor connector • VS sensor or its circuit malfunction	• Engine operates normally • ESP does not work	25-13
21-1	Shift spindle angle sensor circuit Low voltage (less than 0.293 V) • Shift spindle angle sensor or its circuit malfunction	• ESP does not work	25-15
21-2	Shift spindle angle sensor circuit High voltage (more than 4.971 V) • Loose or poor contact of the shift spindle angle sensor connector • Shift spindle angle sensor or its circuit malfunction	• ESP does not work	25-16
22-1	Shift spindle operation malfunction (while operating gearshift mechanism) • Control motor or its circuit malfunction • Shift spindle angle sensor or its circuit malfunction	• ESP does not work	25-17
23-1	Shift spindle operation malfunction (after operating gearshift mechanism) • Shift spindle angle sensor installation problem • Shift spindle angle sensor or its circuit malfunction	• ESP does not work	25-18
24-1	Shift control motor drive circuit • Control motor or its circuit malfunction • Control motor drive circuit malfunction	• ESP does not work	25-19
32-1	Fail-safe relay circuit • Fail-safe relay circuit malfunction	• ESP does not work	25-22
41-1	Gear position switch circuit • Gear position switch circuit malfunction (Short)	• Engine does not start • ESP does not work • Gear position indicator blinks "–"	25-22
41-2	Gear position switch circuit • Gear position switch circuit malfunction (Open)	• ESP does not work • Gear position indicator blinks "–"	25-23
42-1	Gearshift (UP/DOWN) switch circuit • Gearshift (UP/DOWN) switch circuit malfunction (Short)	• ESP does not work	25-25

After '19

NOTE:

- When the gear position indicator "–" is blinking constantly (and the MIL and coolant temperature indicator lights are dark), but no DTC is indicated or retrievable, check the serial communication line (page 24-9).
- There are some DTCs (21-1 thru 23-1) related to the shift spindle angle sensor circuit that have different conditions of malfunction detection. In case of the low voltage (about 0 V) or high voltage (about 5 V) in the shift spindle angle sensor circuit, DTC 22-2 will be indicated when the control motor does not operate.
- If not using the MCS, perform all inspections according to the relevant main code.

DTC	Function Failure	Symptom/Fail-safe function	Refer to
8-1	TP sensor circuit Low voltage (less than 0.225 V) • TP sensor or its circuit malfunction • Loose or poor contact of the TP sensor connector	• Poor engine acceleration • ESP does not work	4-25
8-2	TP sensor circuit High voltage (more than 4.922 V) • TP sensor or its circuit malfunction	• Poor engine acceleration • ESP does not work	4-27
11-1	VS sensor no signal • Loose or poor contact of the VS sensor connector • VS sensor or its circuit malfunction	• Engine operates normally • ESP does not work	25-13
21-1	Shift spindle angle sensor circuit Low voltage (less than 0.215 V) • Shift spindle angle sensor or its circuit malfunction	• ESP does not work	25-15
21-2	Shift spindle angle sensor circuit High voltage (more than 4.619 V) • Loose or poor contact of the shift spindle angle sensor connector • Shift spindle angle sensor or its circuit malfunction	• ESP does not work	25-16
22-1	Shift spindle operation malfunction (while operating gearshift mechanism) • Control motor or its circuit malfunction • Shift spindle angle sensor or its circuit malfunction	• ESP does not work	25-17
23-1	Shift spindle operation malfunction (after operating gearshift mechanism) • Shift spindle angle sensor installation problem • Shift spindle angle sensor or its circuit malfunction	• ESP does not work	25-18
24-1	Shift control motor drive circuit • Control motor or its circuit malfunction • Control motor drive circuit malfunction	• ESP does not work	25-19
27-1	Shift drum position malfunction • TR or its circuit malfunction • Faulty gearshift mechanism	• ESP does not work	25-20
32-1	Fail-safe relay circuit • Fail-safe relay circuit malfunction	• ESP does not work	25-22
33-2 *	PCM EEPROM malfunction	• Does not hold the self-diagnosis data	4-37
42-1	Gearshift (UP/DOWN) switch circuit • Gearshift (UP/DOWN) switch circuit malfunction (Short)	• ESP does not work	25-25
51-1	TR sensor low voltage (less than 0.410 V) • Loose or poor contact of the TR sensor connector • TR sensor or its circuit malfunction	• ESP does not work	25-26
51-2	TR sensor high voltage (more than 4.702 V) • TR sensor or its circuit malfunction	• ESP does not work	25-28
52-1	Neutral switch stuck OFF • Loose or poor contact of the neutral switch connector • Neutral switch or its circuit malfunction	• ESP does not work	25-28
52-2	Neutral switch stuck ON • Neutral switch or its circuit malfunction	• ESP does not work	25-29
57-1	Gearshift mechanism malfunction • TR sensor malfunction • Faulty shifter mechanism	• ESP does not work	25-29
57-2	Gear position malfunction (jumps out of gear) • TR sensor malfunction • Faulty shifter mechanism	• ESP does not work	25-29

* DTC can be readout/erased only by MCS.

DTC TROUBLESHOOTING

NOTE:

- After troubleshooting, erase the DTC and test-ride the vehicle to be sure that the system is normal.

VERIFY PROPER CONNECTOR CONTACT

Many ESP shifting problems and subsequent DTCs are caused by poor connector contacts. The first step in troubleshooting any DTC is to inspect the affected connectors.

CONNECTOR INSPECTION

- Check for moisture in the affected connector
- Check for corrosion
- Check for folded pins on the male side of the connector
- Check for loose pins and/or pins pushed out of the connector

DTC 11-1 (VS SENSOR NO SIGNAL)

NOTE:

- Before starting the troubleshooting, check for loose or poor contact of the following connectors, and recheck the DTC (page 25-13).
  - VS sensor 3P (Black)
  - engine sub-wire harness 6P (Black)
  - PCM 33P (Black and Gray)
- Make sure the battery is fully charged.

1. **VS Sensor System Inspection**

   Erase the DTC (page 25-10).
   Test-ride the vehicle and check the VS sensor signal with the MCS.

   Is the VS sensor signal indicated normally?

   YES – • Intermittent failure.
   • Loose or poor contact of the connector.

   NO – GO TO STEP 2.

2. **VS Sensor Input Voltage Inspection**

   Disconnect the VS sensor 3P (Black) connector (page 25-30).
   Turn the ignition switch ON.

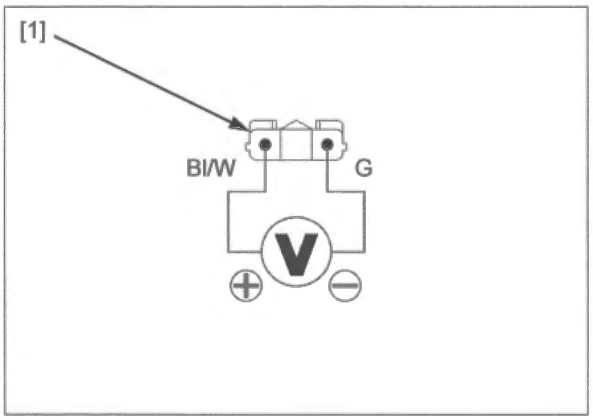
   Measure the voltage between the wire harness side VS sensor 3P (Black) connector [1] terminals.

   Connection: Black/white (+) – Green (–)

   Is the voltage more than 10 V?

   YES – GO TO STEP 3.

   NO – • Open circuit in the Black/white or Black/red wire.
   • Open circuit in the Green wire.



3. **VS Sensor Signal Line Short Circuit Inspection**

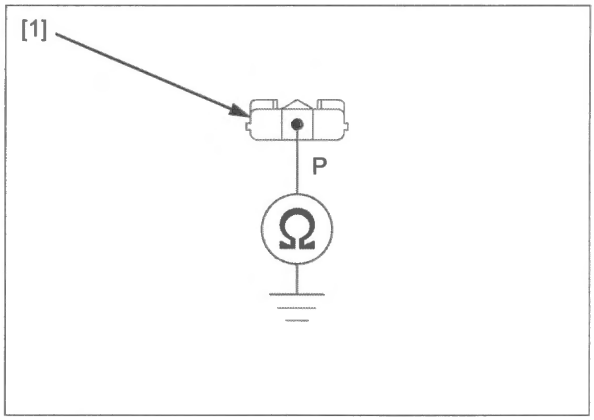
Check for continuity between the wire harness side VS sensor 3P (Black) connector [1] and ground.

Connection: Pink – Ground

Is there continuity?

YES – Short circuit in the pink or Pink/green wire.

NO – GO TO STEP 4.



4. **VS Sensor Signal Line Open Circuit Inspection**

Disconnect the PCM 33P (Gray) connector (page 4-45).

Check for continuity between the wire harness side VS sensor 3P (Black) connector [1] and PCM 33P (Gray) connector [2] terminals.

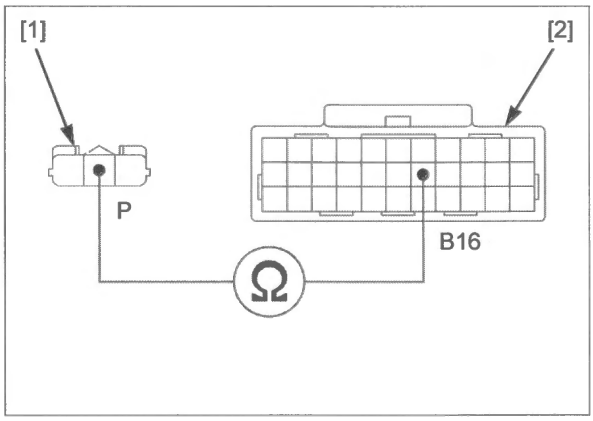
Connection: B16 – Pink

TOOL:
Pin Probe Male (2 pack) **07ZAJ-RDJA110**

Is there continuity?

YES – GO TO STEP 5.

NO – Open circuit in the Pink or Pink/green wire.



5. **VS Sensor Inspection**

Turn the ignition switch OFF.
Replace the VS sensor with a new one (page 25-30).
Erase the DTC (page 25-10).

Test-ride the vehicle and recheck the DTC.

Is the DTC 11-1 indicated?

YES – Replace the PCM with a known good one (page 4-45), and recheck.

NO – Faulty original VS sensor.

DTC 21-1 (SHIFT SPINDLE ANGLE SENSOR LOW VOLTAGE)

NOTE:

- Before starting the troubleshooting, check for loose or poor contact of the following connectors, and recheck the DTC (page 25-13).
  - shift spindle angle sensor 3P (Gray)
  - engine sub-wire harness 6P (Black)
  - PCM 33P (Black)

1. Shift Spindle Angle Sensor System Inspection

Check the shift spindle angle sensor with the MCS.

Is about 0 V indicated?

YES – GO TO STEP 2.

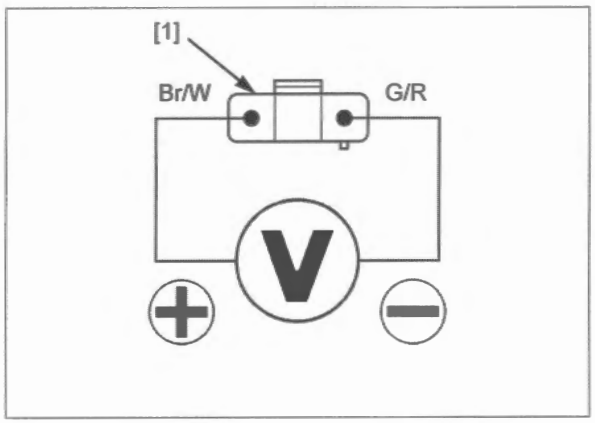
NO – • Intermittent failure.
• Loose or poor contact of the connector.

2. Shift Spindle Angle Sensor Input Voltage Inspection

Disconnect the shift spindle angle sensor 3P (Gray) connector (page 25-30).
Turn the ignition switch ON.

Measure the voltage between the wire harness side shift spindle angle sensor 3P (Gray) connector [1] terminals.

Connection: Brown/white (+) – Green/red (–)



Is the voltage within 4.75 – 5.25 V?

YES – GO TO STEP 3.

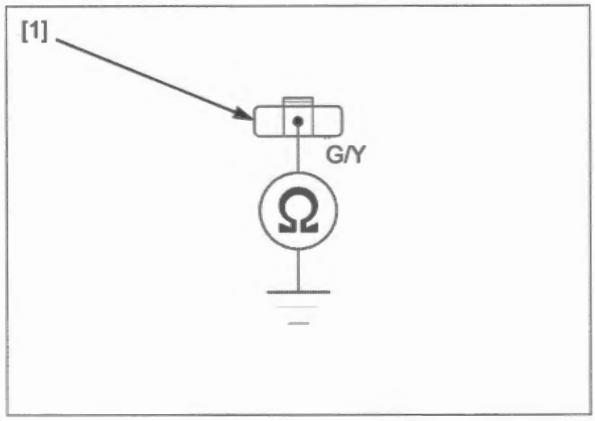
NO – Replace the PCM/ECM with a known good one (page 4-45), and recheck.

3. Shift Spindle Angle Sensor Output Line Short Circuit Inspection

Turn the ignition switch OFF.

Check for continuity between the wire harness side shift spindle angle sensor 3P (Gray) connector [1] terminal and ground.

Connection: Green/yellow – Ground



There should be no continuity.

Is there continuity?

YES – Short circuit in Green/yellow or Green/blue wire.

NO – GO TO STEP 4.

4. Shift Spindle Angle Sensor Inspection

Replace the shift spindle angle sensor with a known good one (page 25-30).
Erase the DTCs (page 25-10).
Connect the PCM 33P (Black) connector and turn the ignition switch ON.

Check the shift spindle angle sensor with the MCS.

Is about 0 V indicated?

YES – Replace the PCM with a known good one (page 4-45), and recheck.

NO – Faulty original shift spindle angle sensor

DTC 21-2 (SHIFT SPINDLE ANGLE SENSOR HIGH VOLTAGE)

1. Shift Spindle Angle Sensor System Inspection

Check the shift spindle angle sensor with the MCS.

Is about 5 V indicated?

YES – GO TO STEP 2.

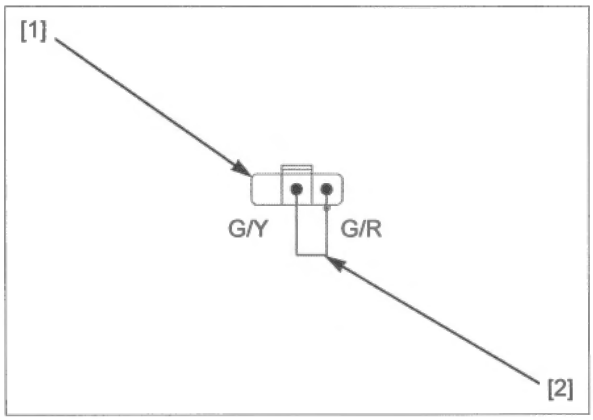
NO – • Intermittent failure.
• Loose or poor contact of the connector.

2. Shift Spindle Angle Sensor Inspection

Turn the ignition switch OFF.
Disconnect the shift spindle angle sensor 3P (Gray) connector (page 25-30).

Connect the wire harness side shift spindle angle sensor 3P (Gray) connector [1] terminals with a jumper wire [2].

Connection: Light green – Green/white



Turn the ignition switch ON.
Check the shift spindle angle sensor with the MCS.

Is about 0 V indicated?

YES – GO TO STEP 3.

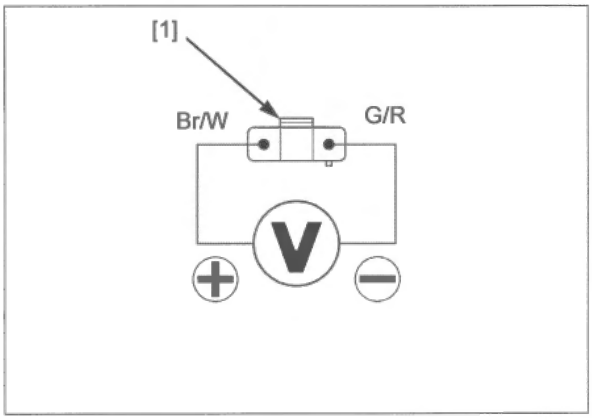
NO – GO TO STEP 4.

3. Shift Spindle Angle Sensor Input Voltage Inspection

Turn the ignition switch ON.

Measure the voltage between the wire harness side shift spindle angle sensor 3P (Gray) connector [1] terminals.

Connection: Brown/white (+) – Green/red (–)



Is the voltage within 4.75 – 5.25 V?

YES – Faulty shift spindle angle sensor.

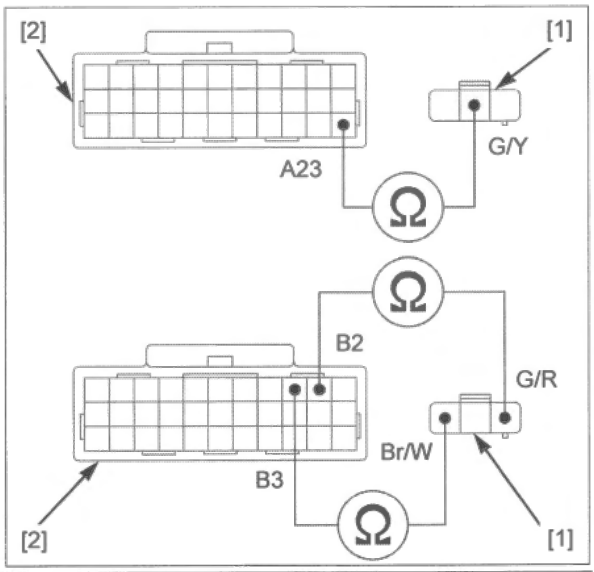
NO – Open circuit in Brown/white wire.

4. Shift Spindle Angle Sensor Each Line Open Circuit Inspection

Disconnect the PCM 33P (Black) connector (page 4-45).

Check for continuity between the wire harness side shift spindle angle sensor 3P (Gray) connector [1] and PCM 33P (Black) connector [2] terminals.

Connection: A23 – Green/yellow
B2 – Green/red
B3 – Brown/white



TOOL:
Pin Probe Male (2 pack) **07ZAJ-RDJA110**

Is there continuity?

YES – Replace the PCM with a known good one (page 4-45), and recheck.

NO – • Open circuit in the Green/yellow or Green/blue wire
• Open circuit in the Green/red wire
• Open circuit in the Brown/white wire

DTC 22-1 (SHIFT SPINDLE ANGLE SENSOR MALFUNCTION: While operating gearshift mechanism)

NOTE:

- Before starting the troubleshooting, check for loose or poor contact of the following connectors, and recheck the DTC (page 25-13).
  – shift spindle angle sensor 3P (Gray)
  – engine sub-wire harness 6P (Black)
  – PCM 33P (Black)

1. Shift Spindle Angle Sensor System Inspection

Check the shift spindle angle sensor with the MCS.

Is about Low voltage (about 0 V) or High voltage (about 5 V) indicated?

YES – • 0 V: Refer to DTC 21-1 (page 25-15).
• 5 V: Refer to DTC 21-2 (page 25-16).

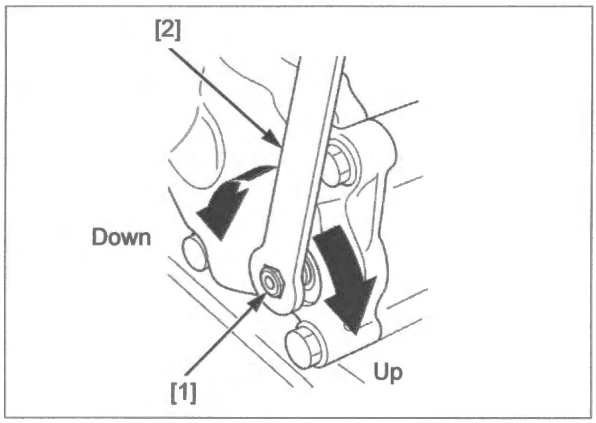
NO – GO TO STEP 2.

2. Shifting Operation Check

DTC 23-1 will be indicated with the ignition switch turned ON.

Remove the tank cover assembly (page 2-4).
Turn the ignition switch OFF.

Manually shift the transmission by rotating the gearshift spindle [1] with the emergency gear change tool [2].



Can the gears be changed manually?

YES – GO TO STEP 3.

NO – Check the gearshift linkage (page 12-18) and the transmission (page 16-7).

3. Shift Control Motor/Reduction Gear Installation Condition Inspection

Turn the ignition switch OFF.
Check that the shift control motor and reduction gears are installed properly and are not damaged (page 25-33).

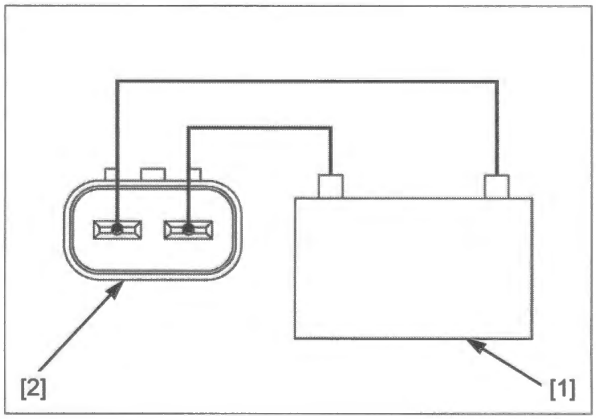
Are the shift control motor and reduction gears in normal condition?

YES – GO TO STEP 4.

NO – Install the shift control motor and reduction gears properly or replace faulty parts.

4. Control Motor Inspection

Remove the shift control motor (page 25-33).
Connect a fully charged 12 V battery [1] to the control motor side 2P connector [2] terminals and check the operation.
Change the battery connection to check the reverse operation.



Does the shift control motor turn in both directions?

YES – GO TO STEP 5.

NO – Faulty control motor.

5. **Shift Spindle Angle Sensor System Inspection**

   Remove the shift spindle angle sensor with the connector connected (page 25-30).
   Turn the ignition switch ON.

   While turning the shift spindle angle sensor shaft, check the shift spindle angle sensor voltage with the MCS.

   When turning the sensor shaft clockwise:
   Voltage increase
   When turning the sensor shaft counterclockwise:
   Voltage decrease

   Does the voltage vary properly?

   YES – GO TO STEP 6.

   NO – Faulty shift spindle angle sensor

6. **Shift Spindle Angle Sensor Condition Inspection**

   Check that the shift spindle angle sensor is installed properly.

   Is the shift spindle angle sensor in normal condition?

   YES – GO TO STEP 7.

   NO – Install properly or replace the angle sensor.

7. **DTC Recheck**

   Recheck the DTC with the MCS.

   Is DTC 22-1 indicated?

   YES – Replace the PCM with a known good one (page 4-45), and recheck.

   NO – Intermittent failure

DTC 23-1 (SHIFT SPINDLE ANGLE SENSOR MALFUNCTION: After operating gearshift mechanism)

Refer to DTC 22-1 (page 25-17).

DTC 24-1 (SHIFT CONTROL MOTOR DRIVE CIRCUIT)

NOTE:

- Before starting the troubleshooting, check for loose or poor contact of the control motor 2P (Black) and PCM 5P (Black) connectors, and recheck the DTC (page 25-13).

1. PCM Motor Power Input Line Inspection

Disconnect the PCM 5P (Black) connector (page 4-45).

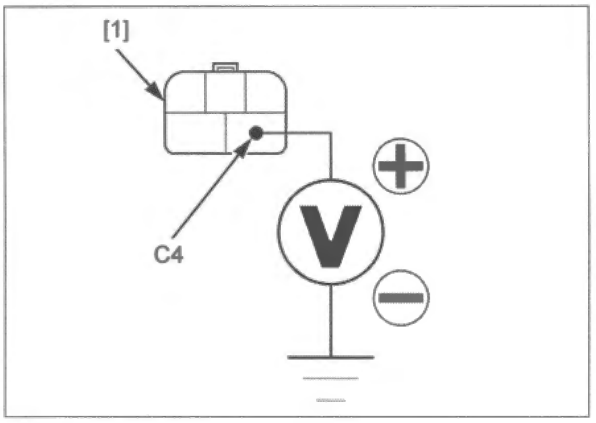
Measure the voltage between the wire harness side PCM 5P (Black) connector [1] terminal and ground.

Connection: C4 (+) – Ground (–)

Is there battery voltage?

YES – GO TO STEP 2.

NO – • Blown ES fuse (30 A).
• Open circuit in the Red/white or Red wire.



2. PCM Motor Power Ground Line Inspection

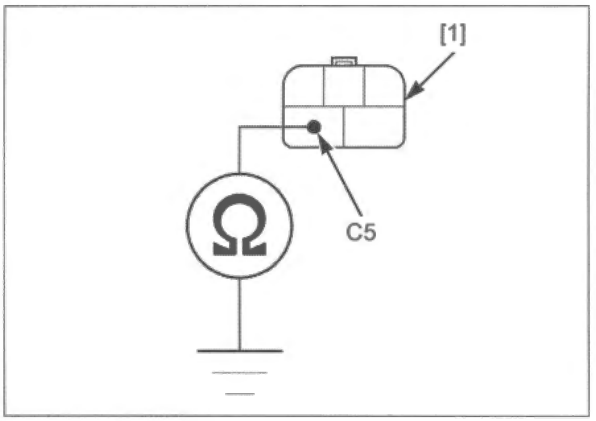
Check for continuity between the wire harness side PCM 5P (Black) connector [1] terminal and ground.

Connection: C5 – Ground

Is there continuity?

YES – GO TO STEP 3.

NO – Open circuit in the Green wire.



3. Control Motor Line Open Circuit Inspection

Disconnect the control motor 2P (Black) connector (page 25-33).

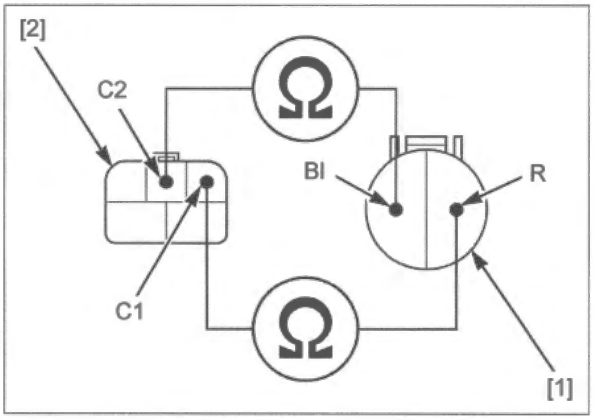
Check for continuity between the wire harness side control motor 2P (Black) connector [1] and PCM 5P (Black) connector [2] terminals.

Connection: C1 – Red
C2 – Black

Is there continuity?

YES – GO TO STEP 4.

NO – • Open circuit in the Red wire.
• Open circuit in the Black wire.



4. Control Motor Line Short Circuit Inspection

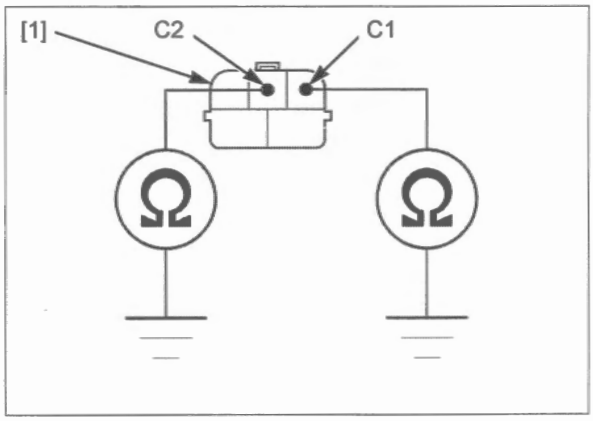
Check for continuity between the wire harness side PCM 5P (Black) connector [1] terminals and ground.

Connection: C1 – Ground
C2 – Ground

Is there continuity?

YES – • Short circuit in the Black wire.
• Short circuit in the Red wire.

NO – GO TO STEP 5.



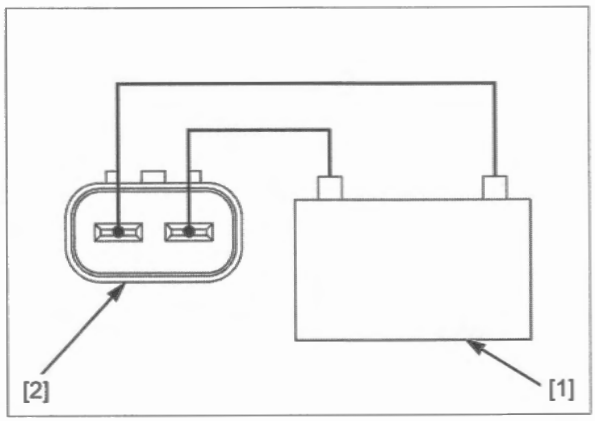
5. Control Motor Inspection

Connect a fully charged 12 V battery [1] to the control motor side 2P connector [2] terminals.

Does the motor turn?

YES – GO TO STEP 6.

NO – Faulty control motor.



6. Electric Shift Failure Checking

Connect the PCM 5P (Black) and control motor 2P (Black) connectors.
Erase the DTC (page 25-10).
Recheck the gear shifting operation and DTC.

Is the DTC 24-1 indicated?

YES – Replace the PCM with a known good one (page 4-45), and recheck. If the DTC indicated again, replace the control motor (page 25-33).

NO – Intermittent failure.

DTC 27-1 (SHIFT DRUM POSITION MALFUNCTION) (After '19)

1. TR Sensor System Inspection

Check the TR sensor with the MCS.

Is Low voltage (about 0 V) or High voltage (about 5 V) indicated?

YES – • About 0 V: See DTC 51-1 (page 25-26).
• About 5 V: See DTC 51-2 (page 25-28).

NO – GO TO STEP 2.

2. **Shift Control Motor/Reduction gear condition**

   Check the shift control motor and reduction gears are installed properly and are not damaged (page 25-33).

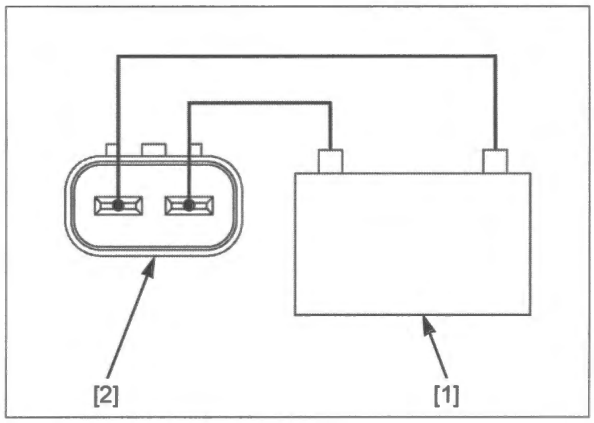
   Are the shift control motor and reduction gears in normal condition?

   YES – GO TO STEP 3.

   NO – Install the shift control motor and reduction gears properly or replace faulty parts.

3. **Shift Control Motor Condition Inspection**

   Remove the shift control motor (page 25-33).
   Connect a fully charged 12 V battery [1] to the shift control motor 2P connector [2] terminals to check the motor operation.
   Change the battery connection to check the reverse operation.

   Does the shift control motor turn in both directions?

   YES – GO TO STEP 4.

   NO – Faulty shift control motor

4. **TR Sensor System Inspection**

   Remove the TR sensor with the connector connected (page 25-32).
   Turn the ignition switch ON.
   While turning the TR sensor shaft, check the TR sensor voltage with the MCS.

   When turning the sensor shaft clockwise:
   Voltage increase
   When turning the sensor shaft counterclockwise:
   Voltage decrease

   Does the voltage vary properly?

   YES – GO TO STEP 5.

   NO – Faulty TR sensor

5. **TR Sensor Condition Inspection**

   Check that the TR sensor is installed properly and is not damaged.

   Is the TR sensor in normal condition?

   YES – GO TO STEP 6.

   NO – Install the TR sensor properly or replace the TR sensor.

6. **DTC Recheck**

   Recheck the DTC with the MCS.

   Is DTC 27-1 indicated?

   YES – Replace the PCM with a known good one, and recheck.

   NO – Intermittent failure

DTC 32-1 (FAIL-SAFE RELAY CIRCUIT)

1. **Recheck DTC**

   Erase the DTC (page 25-10).
   Recheck the DTC.

   Is the DTC 32-1 indicated?

   YES – Replace the PCM with a known good one (page 4-45), and recheck.

   NO – Intermittent failure.

DTC 41-1 (GEAR POSITION SWITCH CIRCUIT: SHORT) ('14 – '19)

NOTE:

- Before starting the troubleshooting, check for loose or poor contact of the following connectors, and recheck the DTC (page 25-13).
  – gear position switch 8P (Gray)
  – PCM 33P (Black)

1. **Gear Position Switch Inspection with MCS**

   Check the gear position switch status with the MCS data list menu.

   Is the gear position status normal?

   YES – Intermittent failure.

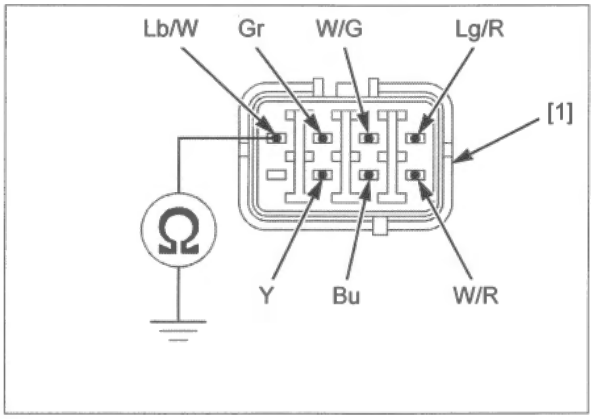
   NO – GO TO STEP 2.

2. **Gear Position Switch Inspection**

   Turn the ignition switch OFF.
   Disconnect the gear position switch 8P (Gray) connector (page 24-17).

   Check for continuity between the gear position switch side 8P (Gray) connector [1] terminals and ground.
   There should be continuity in each gear position, and should be NO continuity in the other position.

Gear position	Connection
Reverse	Gray – Ground
Neutral	Light green/red – Ground
1st	White/green – Ground
2nd	White/red – Ground
3rd	Blue – Ground
4th	Yellow – Ground
5th	Light blue/white – Ground



   Is the gear position switch normal?

   YES – GO TO STEP 3.

   NO – Faulty gear position switch.

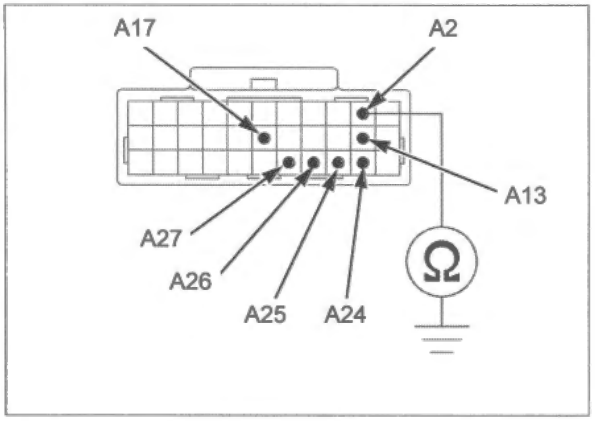
3. **Gear Position Switch Inspection at PCM Connector**

Connect the gear position switch 8P (Gray) connector and disconnect the PCM 33P (Black) connector [1].

Check for continuity between the wire harness side PCM 33P (Black) connector terminals and ground. There should be continuity in each gear position, and should be NO continuity in the other position.

TOOL:

Pin Probe Male (2 pack) 07ZAJ-RDJA110



Gear position	Connection
Reverse	A25 – Ground
Neutral	A17 – Ground
1st	A24 – Ground
2nd	A27 – Ground
3rd	A26 – Ground
4th	A2 – Ground
5th	A13 – Ground

Is the continuity normal condition?

YES – GO TO STEP 4.

NO – Open or short circuit in the wire harness between the PCM and gear position switch.

4. **Recheck DTC**

Connect the PCM 33P (Black) connector.
Erase the DTC (page 25-10).
Shift the transmission into each gear and check the DTC with the MCS.

Is the DTC 41-1 indicated?

YES – Replace the PCM with a known good one (page 4-45), and recheck.

NO – Intermittent failure.

DTC 41-2 (GEAR POSITION SWITCH CIRCUIT: OPEN) ('14 – '19)

NOTE:

- Before starting the troubleshooting, check for loose or poor contact of the following connectors, and recheck the DTC (page 25-13).
  – gear position switch 8P (Gray)
  – PCM 33P (Black)

1. **Gear Position Switch Inspection with MCS**

Check the gear position switch status with the MCS data list menu.

Is the gear position status normal?

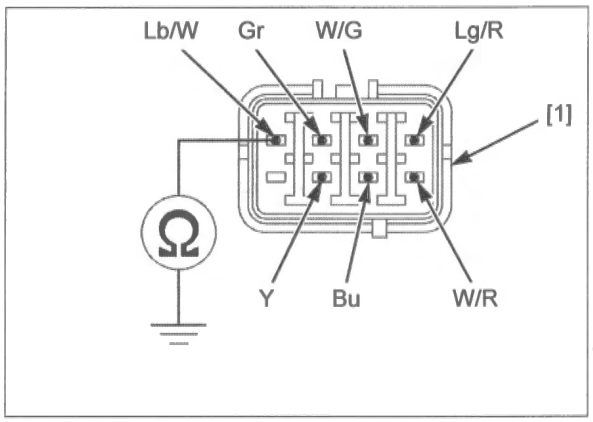
YES – Intermittent failure.

NO – GO TO STEP 2.

2. Gear Position Switch Inspection

Turn the ignition switch OFF.
Disconnect the gear position switch 8P (Gray) connector (page 24-17).

Check for continuity between the gear position switch side 8P (Gray) connector [1] terminals and ground.
There should be continuity in each gear position.



Gear position	Connection
Reverse	Gray – Ground
Neutral	Light green/red – Ground
1st	White/green – Ground
2nd	White/red – Ground
3rd	Blue – Ground
4th	Yellow – Ground
5th	Light blue/white – Ground

Is there continuity?

YES – GO TO STEP 3.

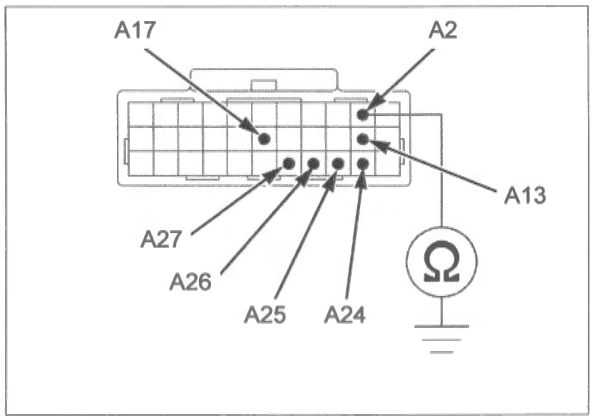
NO – Faulty gear position switch.

3. Gear Position Switch Inspection at PCM Connector

Connect the gear position switch 8P (Gray) connector and disconnect the PCM 33P (Black) connector [1].

Check for continuity between the wire harness side PCM 33P (Black) connector terminals and ground.
There should be continuity in each gear position.

TOOL:
Pin Probe Male (2 pack) **07ZAJ-RDJA110**



Gear position	Connection
Reverse	A25 – Ground
Neutral	A17 – Ground
1st	A24 – Ground
2nd	A27 – Ground
3rd	A26 – Ground
4th	A2 – Ground
5th	A13 – Ground

Is there continuity?

YES – GO TO STEP 4.

NO – Open circuit in the wire harness between the PCM and gear position switch.

4. Recheck DTC

Connect the PCM 33P (Black) connector.
Erase the DTC (page 25-10).
Test-ride the vehicle and check the DTC.

Is the DTC 41-2 indicated?

YES – Replace the PCM with a known good one (page 4-45), and recheck.

NO – Intermittent failure.

DTC 42-1 (GEARSHIFT SWITCH CIRCUIT)

NOTE:

- Before starting the troubleshooting, check for loose or poor contact of the following connectors, and recheck the DTC (page 25-13).
  - handlebar switch 14P ('14 model: Green, After '14 model: Gray)
  - PCM 33P (Black and Gray)

1. Gearshift Switch Inspection

Check the gearshift switch status with the MCS data list menu.

'14 –'19

	UP	DOWN
"Up" ON	3.64 – 4.08 V	1.76 – 2.09 V
"Down" ON	1.76 – 2.09 V	3.64 – 4.08 V
Both ON	4.0 – 4.99 V	4.0 – 4.99 V
Both OFF	0 – 0.99 V	0 – 0.99 V

After '19

	UP	DOWN
"Up" ON	2.78 – 4.10 V	0.70 – 2.25 V
"Down" ON	0.70 – 2.25 V	2.78 – 4.10 V
Both ON	3.17 – 4.32 V	3.17 – 4.32 V
Both OFF	0 – 0.41 V	0 – 0.41 V

Is the gearshift switch status normal?

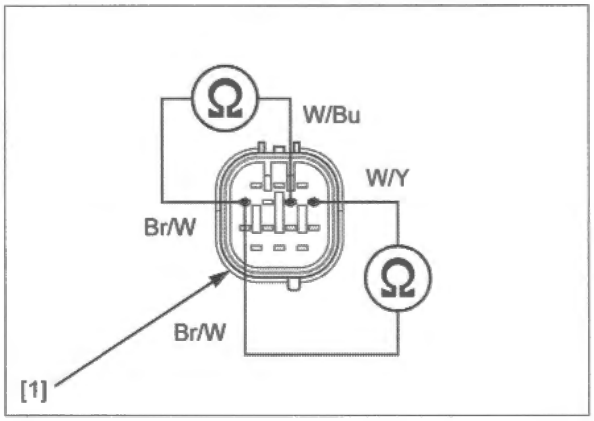
YES – Intermittent failure

NO – GO TO STEP 2.

2. Gearshift Switch Inspection at Handlebar Switch Connector

Turn the ignition switch OFF.
Disconnect the handlebar switch 14P ('14 model: Green, After '14 model: Gray) connector [1].
Check for continuity between the handlebar switch side 14P ('14 model: Green, After '14 model: Gray) connector terminals while pushing the gearshift switch.

Connection:
With the upshift switch pushed:
Brown/white – White/blue
With the downshift switch pushed:
Brown/white – White/yellow



Is there continuity?

YES – GO TO STEP 3.

NO – Faulty handlebar switch.

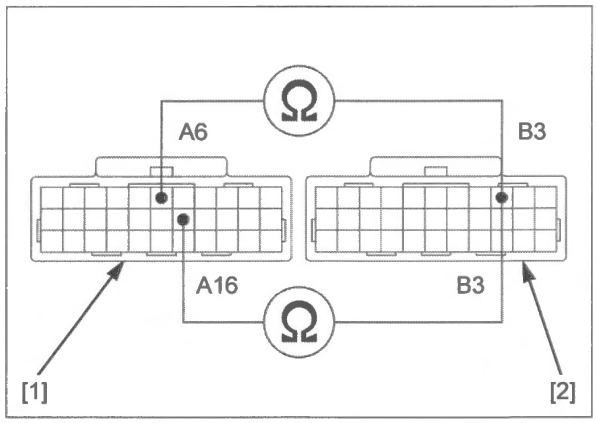
3. **Gearshift Switch Inspection at PCM Connector**

   Connect the handlebar switch 14P ('14 model: Green, After '14 model: Gray) connector and disconnect the PCM 33P connectors (page 4-45).

   Check for continuity between the wire harness side PCM 33P (Black) connector [1] and PCM 33P (Gray) connector [2] terminals while pushing the gearshift switch.

   TOOL:
   Pin Probe Male (2 pack) **07ZAJ-RDJA110**

   Connection:
   With the upshift switch pushed:
   B3 – A6
   With the downshift switch pushed:
   B3 – A16



   Is there continuity?

   YES – GO TO STEP 4.

   NO – Open circuit in the Brown/white, White/blue or White/yellow wire between the switch and PCM.

4. **Recheck DTC**

   Connect the PCM 33P connectors.
   Erase the DTC (page 25-10).
   Check the shift operation and the DTC with the MCS.

   Is the DTC 42-1 indicated?

   YES – Replace the PCM with a known good one (page 4-45), and recheck.

   NO – Intermittent failure.

DTC 51-1 (TR SENSOR LOW VOLTAGE) (After '19)

- Before starting the inspection, check for loose or poor contact of the TR sensor 8P (Black) and PCM 33P connectors, and recheck the DTC.

1. **TR Sensor System Inspection**

   Check the TR sensor with the MCS.

   Is about 0 V indicated?

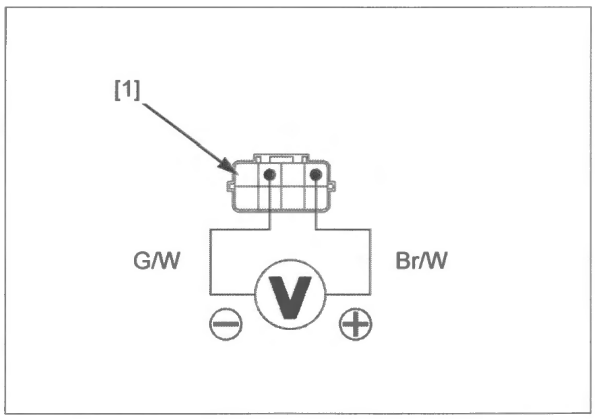
   YES – GO TO STEP 2.

   NO – Intermittent failure

2. **TR Sensor Input Voltage Inspection**

   Turn the ignition switch OFF.
   Disconnect the TR sensor 8P (Black) connector (page 25-32).
   Turn the ignition switch ON.
   Measure the voltage at the wire harness side 8P (Black) connector [1].

   Connection: Brown/white (+) – Green/white (–)



   Is the voltage within 4.75 – 5.25 V?

   YES – GO TO STEP 5.

   NO – GO TO STEP 3.

3. TR Sensor Input Line Open Circuit Inspection

Turn the ignition switch OFF.
Disconnect the PCM 33P (Gray) connector (page 4-45).
Check for continuity between the wire harness side 33P (Gray) connector [1] and 8P (Black) connector [2].

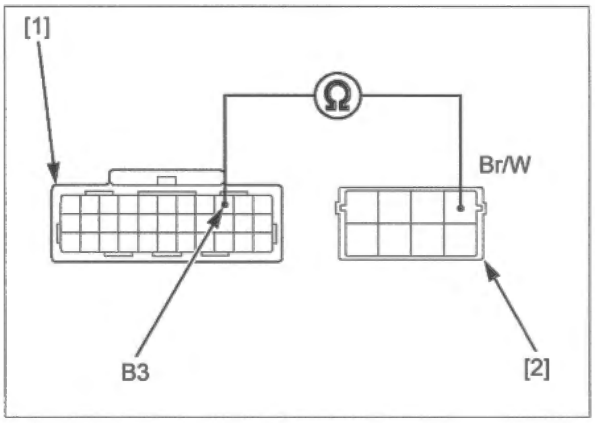
TOOL:
Test probe, 2 packs 07ZAJ-RDJA110

Connection: B3 – Brown/white

Is there continuity?

YES – GO TO STEP 4.

NO – Open circuit in the Brown/white wire



4. TR Sensor Ground Line Open Circuit Inspection

Check for continuity between the wire harness side 33P (Gray) connector [1] and 8P (Black) connector [2].

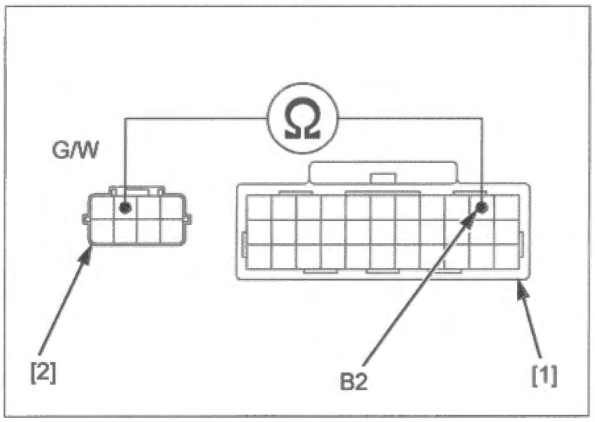
TOOL:
Test probe, 2 packs 07ZAJ-RDJA110

Connection: B2 – Green/white

Is there continuity?

YES – Replace the PCM with a known good one (page 4-45) and recheck.

NO – Open circuit in the Green/white wire



5. TR Sensor Signal Line Open Circuit Inspection

Turn the ignition switch OFF.
Disconnect the PCM 33P (Black) connector (page 4-45).
Check for continuity between the wire harness side 33P (Black) connector [1] and 8P (Black) connector [2].

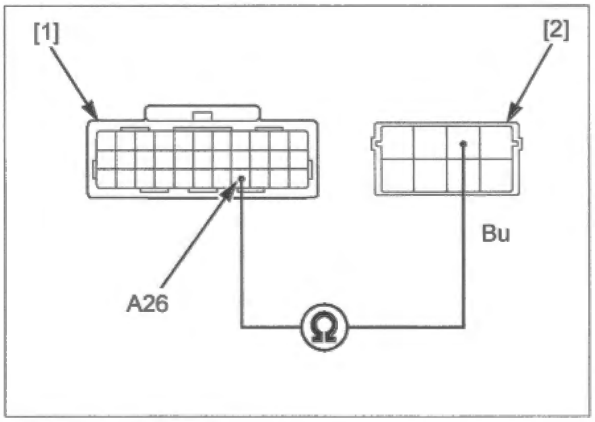
TOOL:
Test probe, 2 packs 07ZAJ-RDJA110

Connection: A26 – Blue

Is there continuity?

YES – GO TO STEP 6.

NO – Open circuit in the Blue wire



6. TR Sensor Output Line Short Circuit Inspection

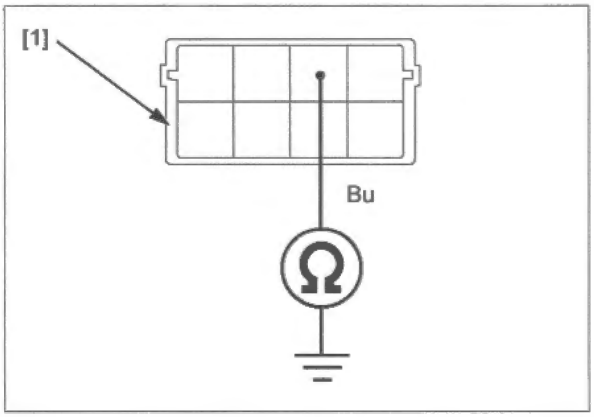
Check for continuity between the wire harness side 8P (Black) connector [1] and ground.

Connection: Blue – ground

Is there continuity?

YES – Short circuit in the Blue wire

NO – GO TO STEP 7.



7. **TR Sensor Inspection**

   Replace the TR sensor with a known good one (page 25-32).
   Connect the 8P (Black) connector and 33P (Black) connector.
   Check the TR sensor with the MCS.

   Is about 0 V indicated?

   YES – Replace the PCM with a known good one (page 4-45) and recheck.

   NO – Faulty original TR sensor

DTC 51-2 (TR SENSOR HIGH VOLTAGE) (After '19)

1. **TR Sensor System Inspection**

   Check the TR sensor with the MCS.

   Is about 5 V indicated?

   YES – GO TO STEP 2.

   NO – Intermittent failure

2. **TR Sensor Inspection**

   Replace the TR sensor with a known good one (page 25-32).
   Turn the ignition switch ON.
   Check the TR sensor with the MCS.

   Is about 5 V indicated?

   YES – Replace the PCM with a known good one (page 4-45) and recheck.

   NO – Faulty original TR sensor

DTC 52-1 (NEUTRAL SWITCH STUCK OFF) (After '19)

NOTE:

- Before starting the inspection, check for loose or poor contact on the neutral switch and PCM 33P (Black) connector, and recheck the DTC.

1. **DTC Recheck**

   Recheck the DTC with the MCS.

   Is DTC 52-1 indicated?

   YES – GO TO STEP 2.

   NO – Intermittent failure

2. **Neutral Switch Line Open Circuit Inspection**

   Turn the ignition switch OFF.
   Disconnect the PCM 33P (Black) connector and neutral switch connector.
   Check for continuity between the wire harness side PCM 33P (Black) connector [1] and neutral switch connector [2] terminals.

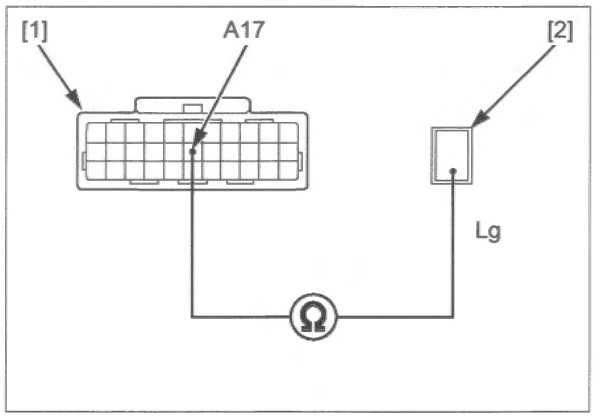
   Connection: A17 – Light green

   TOOL:
   Test probe **07ZAJ-RDJA110**

   Is there continuity?

   YES – GO TO STEP 3.

   NO – Open circuit in the Light green wire



3. **Neutral Switch Inspection**

   Replace the neutral switch with a known good one (page 25-33).
   Connect the PCM 33P (Black) connector and neutral switch connector.
   Erase the DTC (page 25-10).
   Turn the ignition switch ON.
   Recheck the DTC with the MCS.

   Is DTC 52-1 indicated?

   YES – Replace the PCM with a known good one, and recheck.

   NO – Faulty original neutral switch

DTC 52-2 (NEUTRAL SWITCH STUCK ON) (After '19)

1. **Neutral Switch Line Short Circuit Inspection**

   Disconnect the neutral switch connector.
   Check for continuity between the neutral switch connector terminal and ground.

   Connection: Light green – Ground

   Is there continuity?

   YES – Short circuit in the Light green wire.

   NO – GO TO STEP 2.

2. **Neutral Switch Inspection**

   Replace the neutral switch with a known good one (page 25-33).
   Erase the DTC (page 25-10).
   Connect the neutral switch connector.
   Check the DTC with the MCS.

   Is DTC 52-2 indicated?

   YES – Replace the PCM with a known good one, and recheck.

   NO – Faulty original neutral switch

DTC 57-1 (GEARSHIFT MECHANISM MALFUNCTION) (After '19)

See DTC 27-1 (page 25-20).

DTC 57-2 (GEAR POSITION MALFUNCTION; JUMPS OUT OF GEAR) (After '19)

See DTC 27-1 (page 25-20).

VS SENSOR

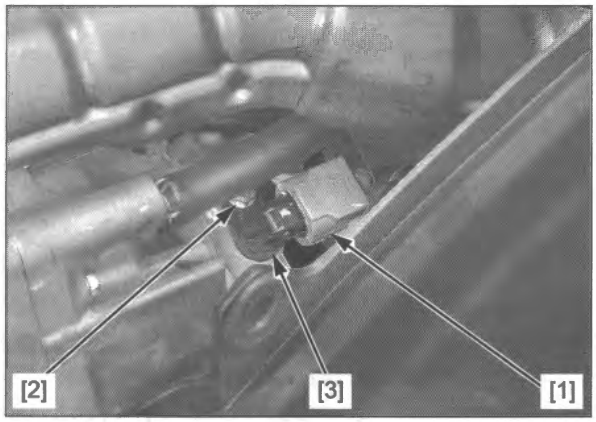
REMOVAL/INSTALLATION

Remove the tank cover assembly (page 2-4).

Turn the ignition switch OFF.

Disconnect the VS sensor 3P (Black) connector [1].

Remove the bolt [2] and VS sensor [3] from the rear crankcase cover.

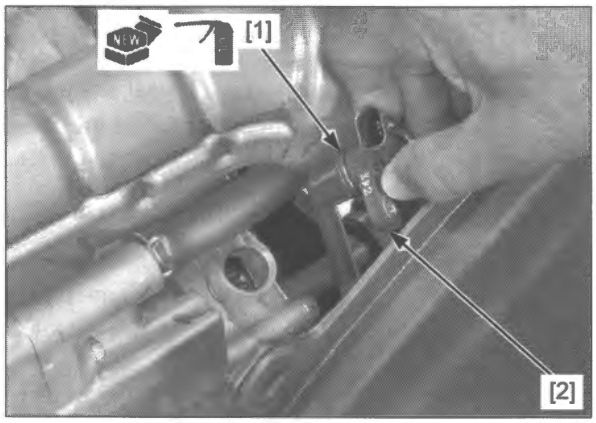


Coat a new O-ring [1] with engine oil and install it onto the VS sensor [2].

Install the VS sensor to the rear crankcase cover and tighten the bolt securely.

Connect the VS sensor 3P (Black) connector.

Install the tank cover assembly (page 2-4).



SHIFT SPINDLE ANGLE SENSOR

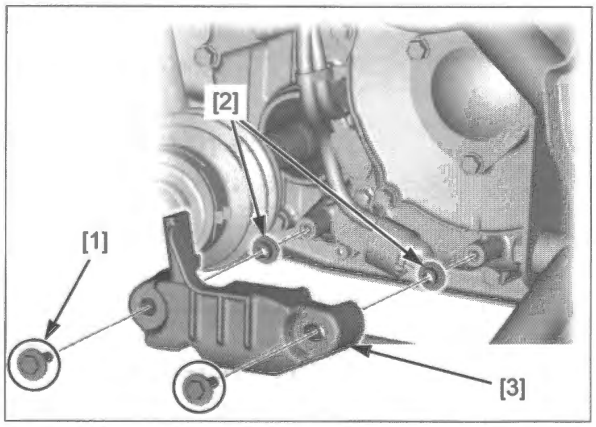
REMOVAL

Remove the following:

- engine guard (page 2-8)
- right center mudguard (page 2-5)

After '19: Remove the following:

- two bolts [1]
- two collars [2]
- sensor cover [3]

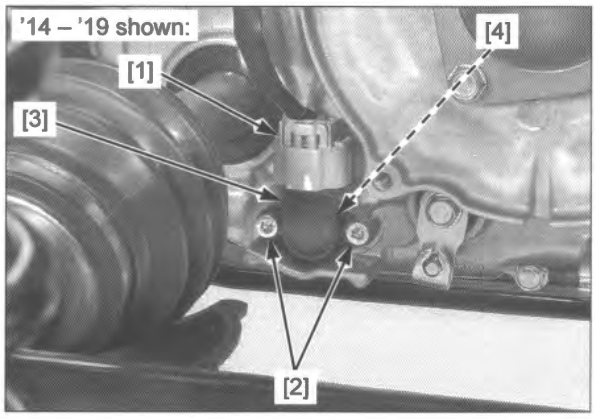


Disconnect the shift spindle angle sensor 3P (Gray) connector [1].

Remove the socket bolts [2] and shift spindle angle sensor [3].

Remove the O-ring [4] from the shift spindle angle sensor.

Check the shift spindle angle sensor for wear or damage.



INSTALLATION

Coat a new O-ring [1] with engine oil and install it into the shift spindle angle sensor [2] groove.

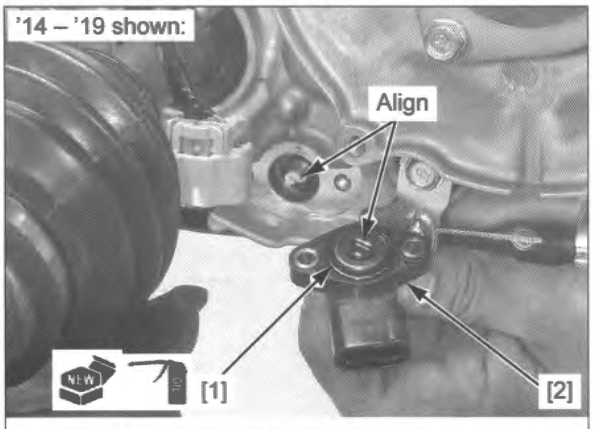
Apply locking agent to the threads of the shift spindle angle sensor socket bolts [3] (page 1-17).

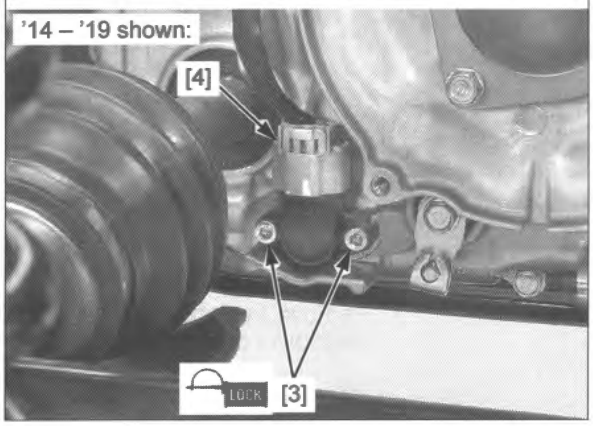
Carefully install the shift spindle angle sensor by aligning the flat surfaces of the sensor shaft hole and gearshift spindle end.

Install and tighten the two socket bolts to the specified torque.

TORQUE: 5 N·m (0.5 kgf·m, 3.6 lbf·ft)

Connect the shift spindle angle sensor 3P (Gray) connector [4].





After '19: Install the following:

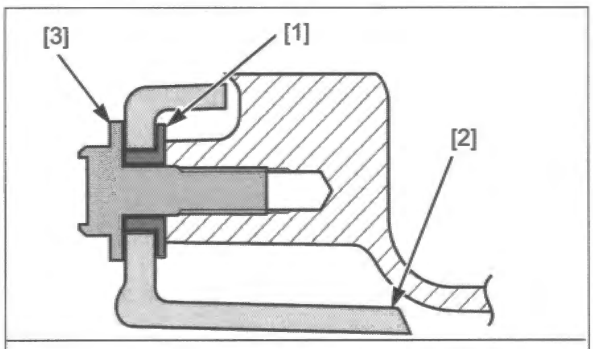
- two collars [1]
- sensor cover [2]
- two bolts [3]

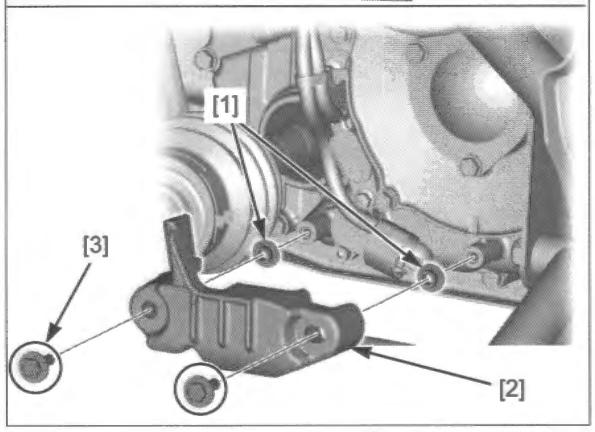
NOTE:

- Install the sensor cover as shown.

Install the following:

- engine guard (page 2-8)
- right center mudguard (page 2-5)





TR SENSOR (After '19)

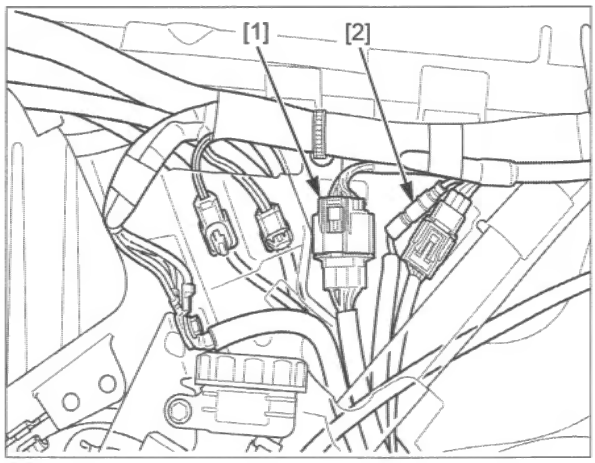
REMOVAL/INSTALLATION

Remove the following:

- engine guard (page 2-8)
- right center mudguard (page 2-5)
- sensor cover (page 25-30)

Disconnect the following:

- sensor harness 8P (Black) connector [1]
- neutral switch wire connector [2]



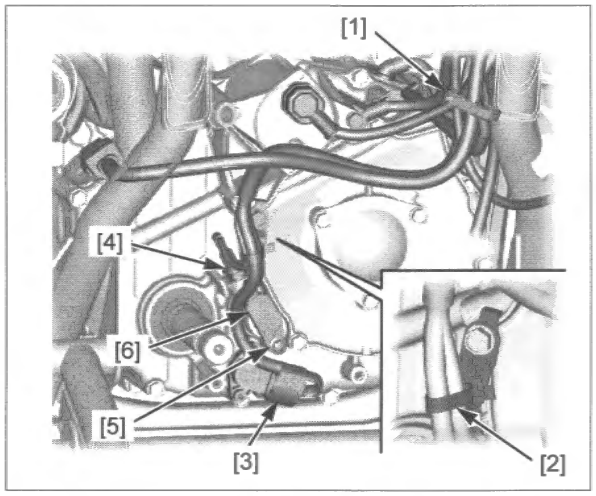
Remove the harness band [1].

Release the harness clip [2].

Disconnect the following:

- spindle angle sensor 3P (Gray) connector [3]
- neutral switch connector [4]

Remove the bolt [5] and TR sensor [6] from the rear crankcase cover.



Coat a new O-ring [1] with engine oil and install it into the TR sensor [2] groove.

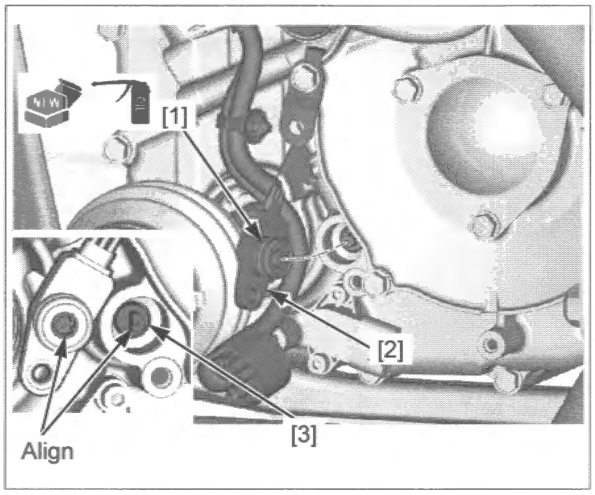
Install the TR sensor by aligning the flat surface of the sensor hole and shift drum end [3].

Install the socket bolts and tighten them.

TORQUE:

TR sensor mounting bolt:
12 N·m (1.2 kgf·m, 9 lbf·ft)

Install the removed part in the reverse order of removal.



NEUTRAL SWITCH (After '19)

REMOVAL/INSTALLATION

Remove the following:

- engine guard (page 2-8)
- right center mudguard (page 2-5)

Disconnect the neutral switch connector [1].

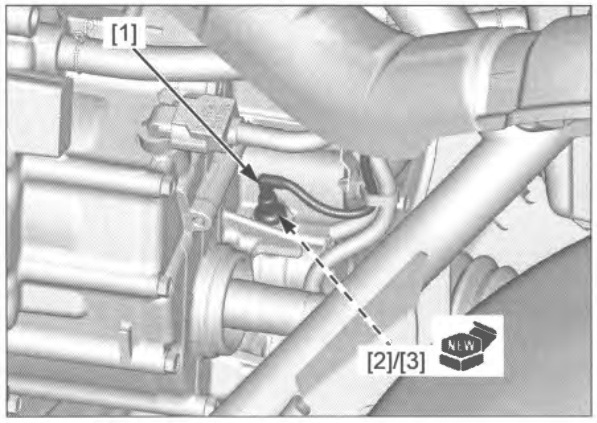
Remove the neutral switch [2] and washer [3].

Install the removed part in the reverse order of removal.

NOTE:

- Replace the washer with a new one.

TORQUE: 13 N·m (1.3 kgf·m, 10 lbf·ft)



SHIFT CONTROL MOTOR/REDUCTION GEARS

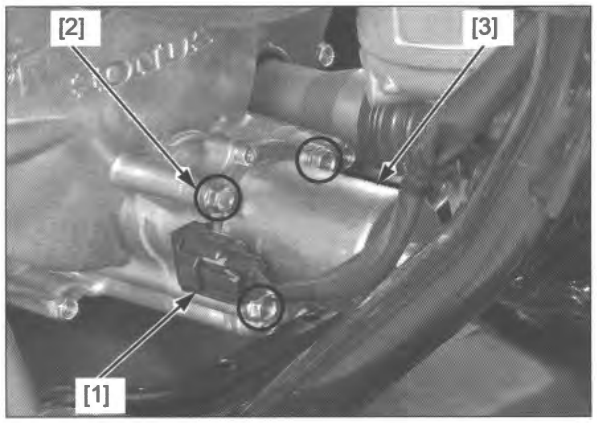
REMOVAL

CONTROL MOTOR

Remove the tank cover assembly (page 2-4).

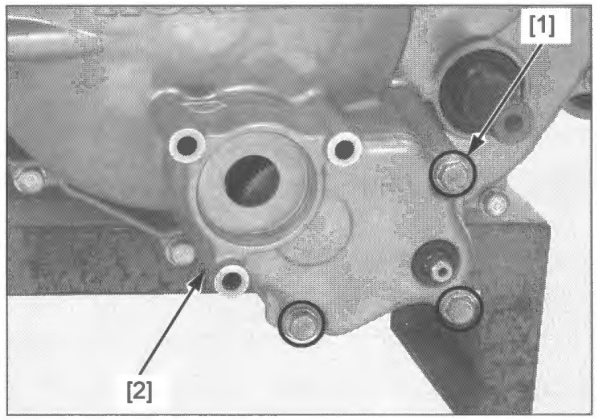
Disconnect the control motor 2P (Black) connector [1].

Remove the three bolts [2] and the control motor [3].



REDUCTION GEARS

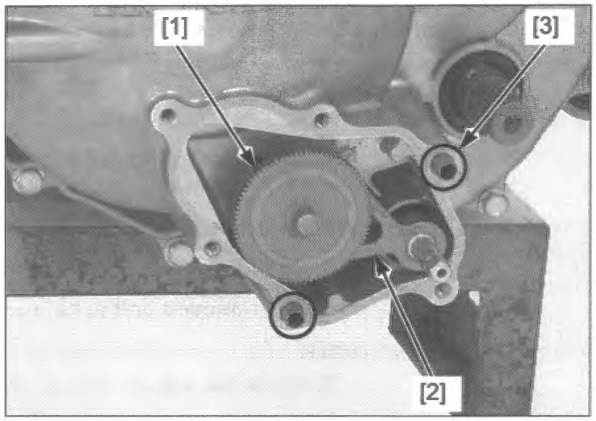
Remove the three bolts [1] and the gear cover [2].



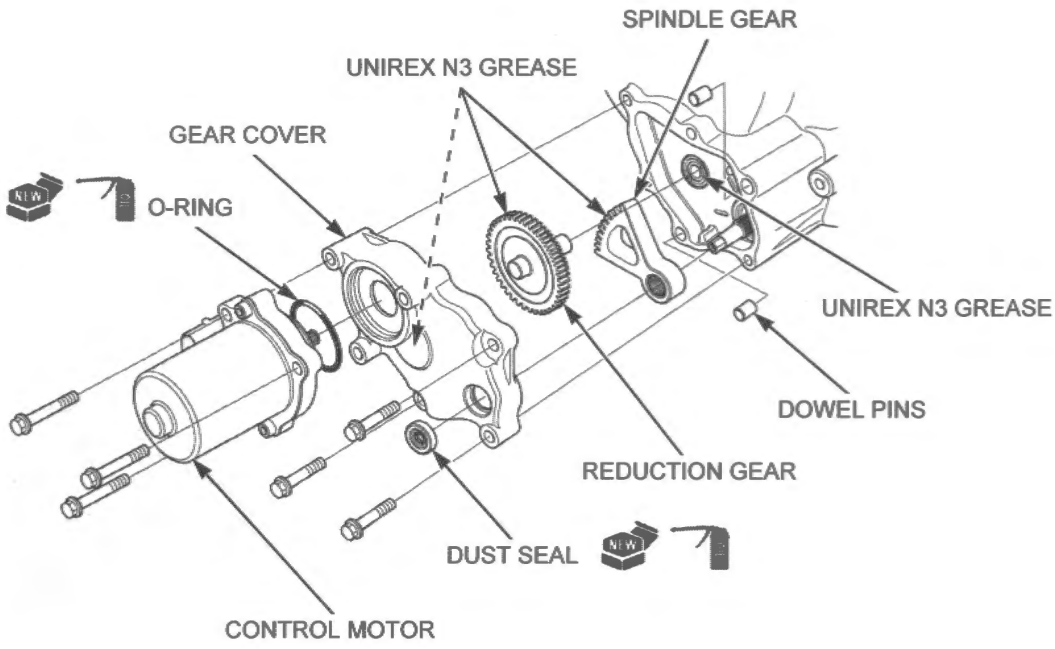
Remove the following:

- reduction gear [1]
- spindle gear [2]
- two dowel pins [3]

Check the gear teeth and splines for wear or damage.



INSTALLATION



Remove any grease from the gears, gear cover and crankcase cover.

Clean the mating surfaces of the covers thoroughly, being careful not to damage them.

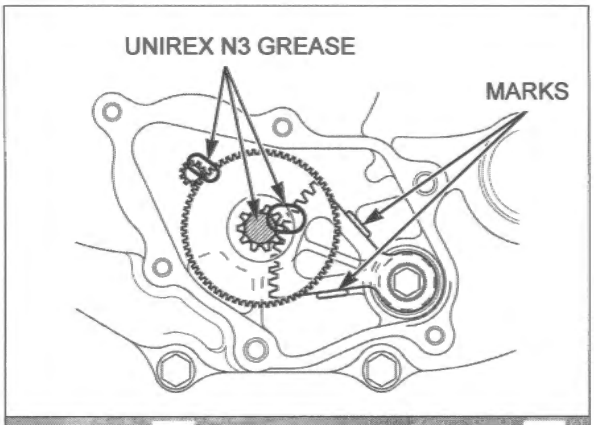
Install the spindle gear [1] by aligning with the reference marks on the crankcase cover.

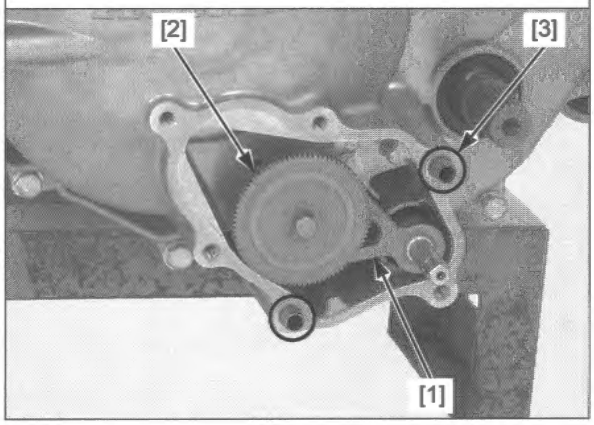
Apply 2 – 4 g (0.07 – 0.14 oz) of specified grease to the gear journals (both sides of the reduction gear) and gears teeth as shown.

Install the reduction gear [2].

SPECIFIED GREASE: UNIREX N3 grease (EXXON)

Install the dowel pins [3] into the crankcase cover.





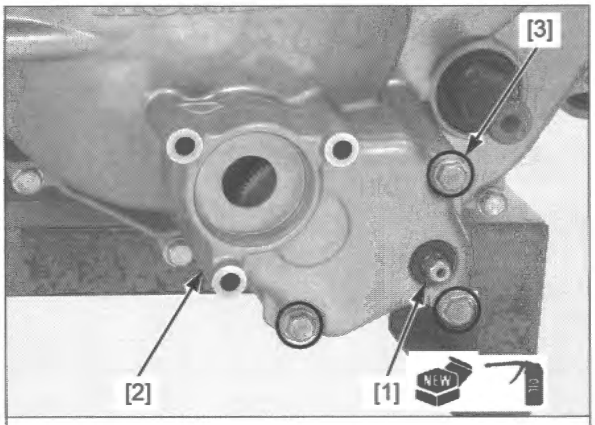
Apply engine oil to the seal lips of a new dust seal [1].

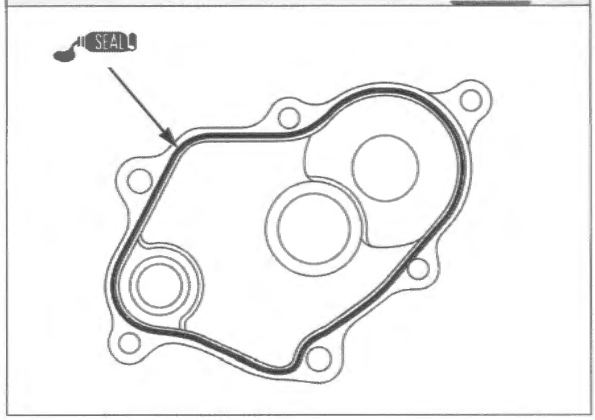
Install the dust seal into the gear cover [2] with the flat side facing out until it is fully seated.

Apply liquid sealant (ThreeBond 1215 or equivalent) to the mating surface of the gear cover as shown.

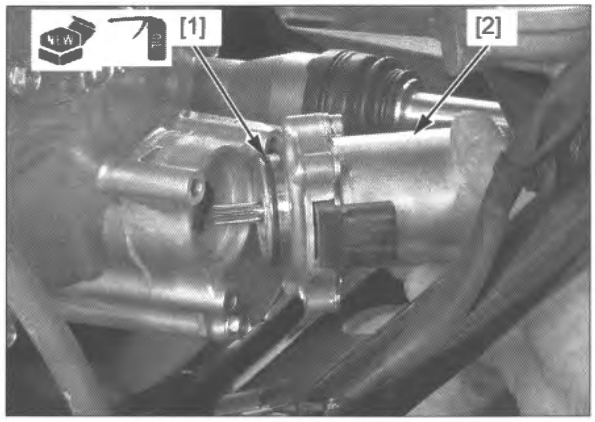
Tighten the bolts after installing the control motor.

Install the gear cover with the three bolts [3].





Coat a new O-ring [1] with engine oil and install it into the control motor [2] groove.

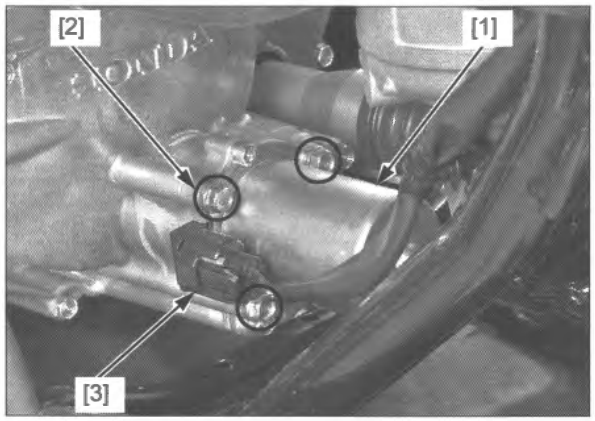


Install the control motor [1] with the three bolts [2].

Tighten the six bolts in a crisscross pattern in several steps.

Connect the control motor 2P (Black) connector [3].

Install the tank cover assembly (page 2-4).



26. ELECTRIC POWER STEERING (EPS: FM2/FM6/FM7/FE2/FA6/FA7)

SERVICE INFORMATION 26-2

EPS COMPONENT LOCATION 26-3

EPS SYSTEM DIAGRAM 26-4

SYMPTOM TROUBLESHOOTING 26-5

EPS TROUBLESHOOTING INFORMATION 26-5

EPS DTC INDEX 26-11

DTC TROUBLESHOOTING 26-13

EPS INDICATOR CIRCUIT INSPECTION 26-27

EPS ECU 26-30

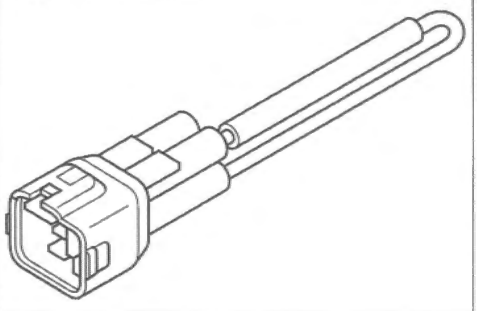
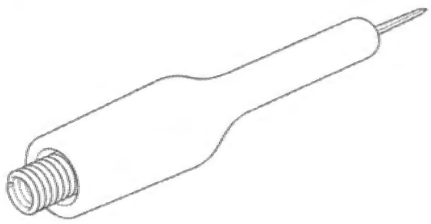
SERVICE INFORMATION

GENERAL

- This section covers electrical system service of the EPS (FM2/FM6/FM7/FE2/FA6/FA7). For other service of the steering system, see Front Wheel/Suspension/Steering section (page 18-28).
- When performing the DTC troubleshooting, read "EPS Troubleshooting Information" carefully (page 26-5), and inspect and troubleshoot according to the DTC. Observe each step of the procedures one by one. Note the DTC and probable faulty part before starting diagnosis and troubleshooting.
- The EPS ECU may be damaged if dropped. Also, if the connector is disconnected when current is flowing, the excessive voltage may damage the EPS ECU. Always turn off the ignition switch before disconnecting or connecting the connectors.
- The following color codes are used throughout this section.

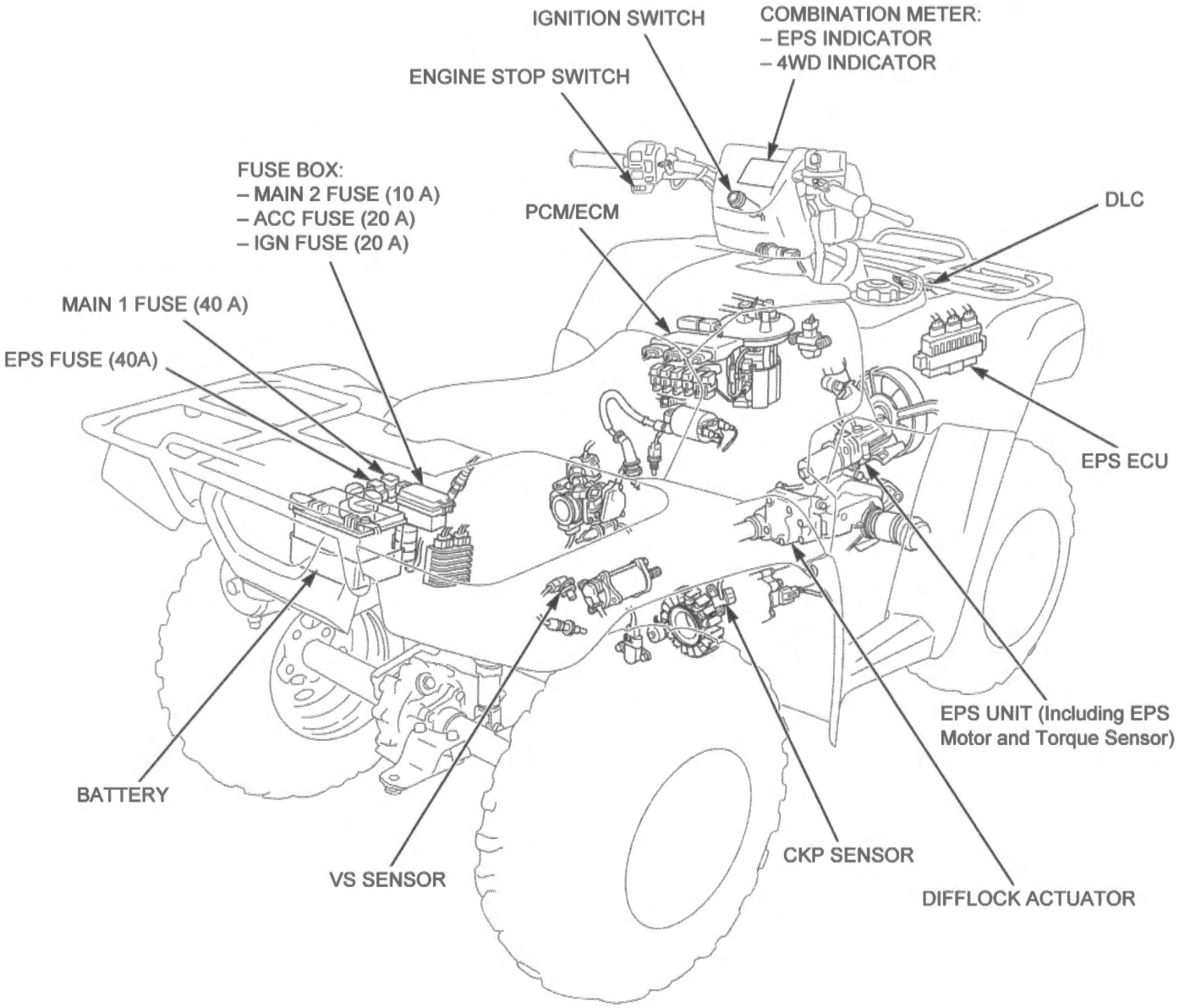
Bl = Black	Bu = Blue	Gr = Gray	O = Orange	R = Red	W = White
Br = Brown	G = Green	Lg = Light green	P = Pink	Lb = Light blue	Y = Yellow
V = Violet					

TOOLS

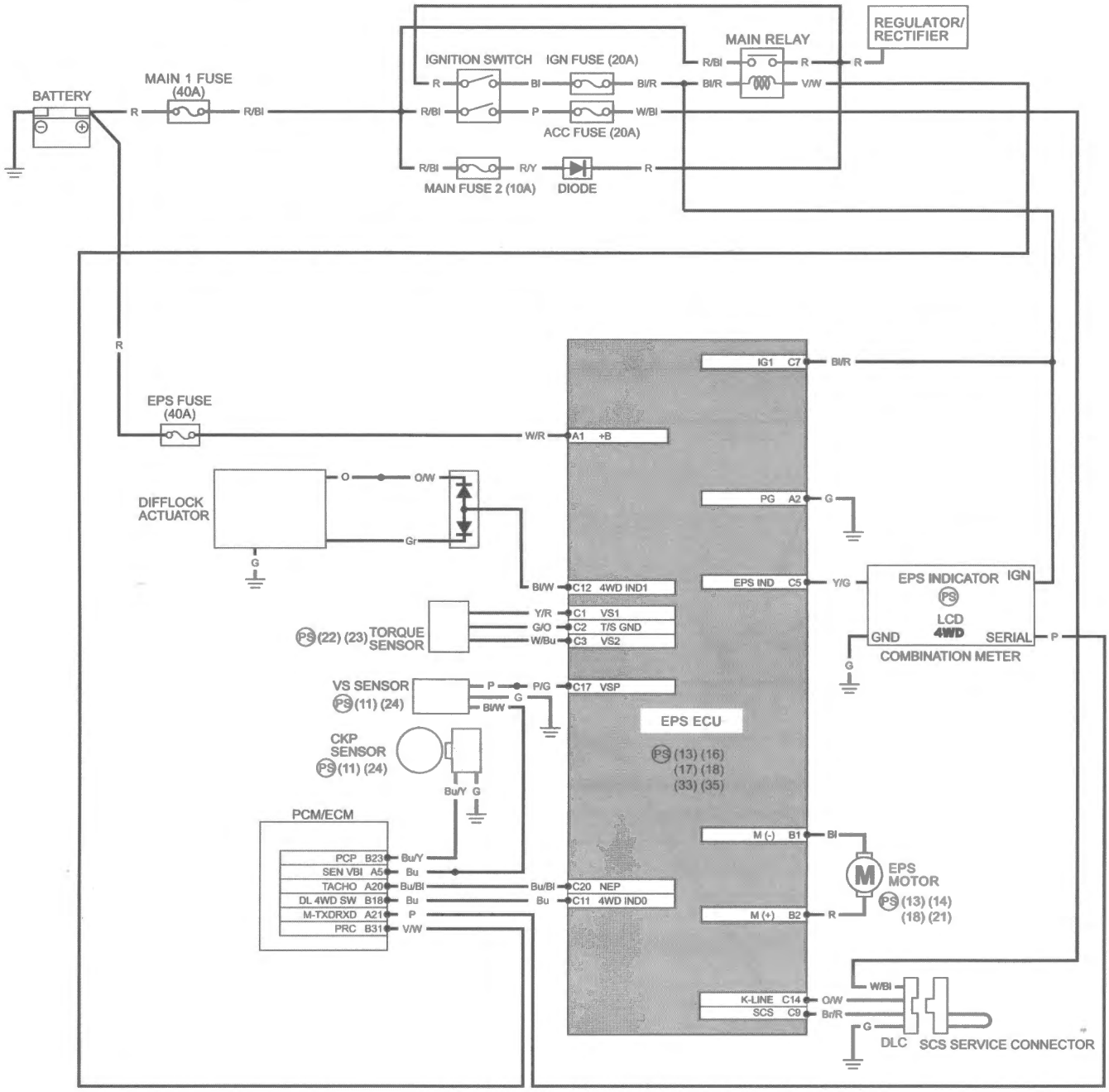
SCS Service Connector 070PZ-ZY30100	Pin Probe Male (2 pack) 07ZAJ-RDJA110
	

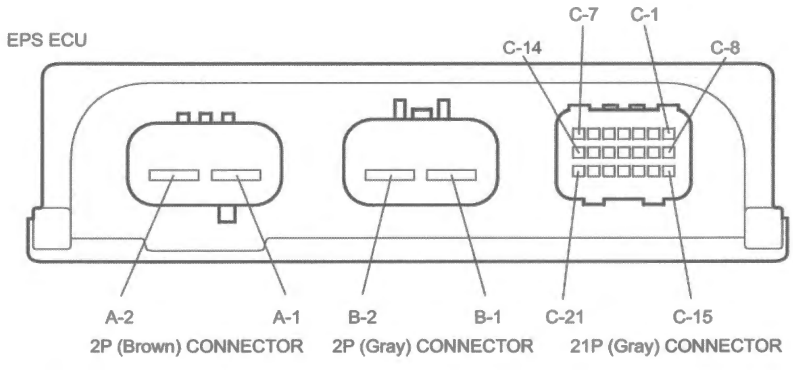
EPS COMPONENT LOCATION

'14 model shown:



EPS SYSTEM DIAGRAM





PS ( ): EPS indicator blink

: Short terminals for reading DTC

SYMPTOM TROUBLESHOOTING

Symptom	Diagnosis	Also check for
EPS indicator does not come on	Inspect the EPS indicator circuit (page 26-27)	• Short circuit between the combination meter and EPS ECU • Faulty combination meter
EPS indicator does not go off, and no DTCs are stored	Inspect the EPS indicator circuit (page 26-28)	• Open circuit between the combination meter and EPS ECU • Short circuit in the DLC related wire • Open circuit in the EPS ECU line • Open circuit in the motor power input line • Open circuit in the power ground line

EPS TROUBLESHOOTING INFORMATION

GENERAL TROUBLESHOOTING

- Refer to the "GENERAL TROUBLESHOOTING" in "PGM-FI system" (page 4-12).

SYSTEM DESCRIPTION

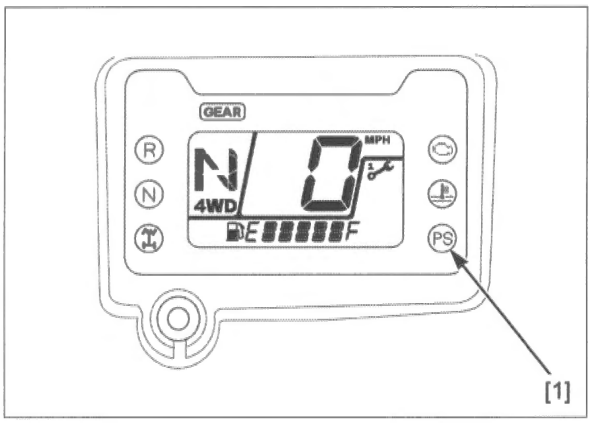
SELF-DIAGNOSIS SYSTEM

The EPS system is equipped with the self-diagnostic system. If the EPS ECU detects a system failure, it functions as follows:

1. Turns on the EPS indicator [1] to notify the rider of the problem.
2. Stores a DTC (Diagnostic Trouble Code) in its erasable memory.
3. Stops power assist (manual steering operation begins or reduces the assist power).

Self-diagnosis can be classified into three categories:

– Initial diagnosis: performed right after the engine starts and until the EPS indicator goes off.
– Regular diagnosis: performed right after the initial diagnosis until the ignition switch is turned OFF.
– Revest: The EPS indicator turns on when the DTC is set. The EPS indicator will turn off after the vehicle has recovered from the fail-safe condition, but the DTC will be stored in the EPS ECU. There was a temporary problem, but the system is now fully operational.



DTC (Diagnostic Trouble Code)

The DTC(s) is memorized in the EEPROM (nonvolatile memory) therefore the memorized DTC(s) cannot be erased by disconnecting the battery. Perform the specified procedures to erase the DTC(s) (page 26-7).

EPS INDICATOR

Under normal conditions, the EPS indicator comes on when the ignition switch is turned ON, then goes off after starting the engine. This indicates that the LED and its circuit are operating correctly.

If there is any trouble in the system after the engine is started, the EPS indicator will stay on and the EPS ECU memorizes the DTC. (When the DTC 22 (failure to initialize the torque sensor) is stored, the EPS indicator will blink.)

When a problem is detected and the EPS indicator comes on, there are cases that the indicator stays on until the ignition switch is turned OFF, and the indicator goes off automatically when the system returns to normal.

If a problem continues after restarting the engine, the EPS indicator stays on and the EPS ECU stops the EPS function.

When the DTC 23 (torque sensor problem) is stored in the EPS ECU, the EPS indicator will stay on until the DTC is erased.

RESTRICTION ON POWER ASSIST OPERATION

Repeated extreme steering force, such as turning the handlebar continuously back-and-forth with the vehicle stopped, causes an increase of power consumption in the EPS motor. The increase of electric current causes the motor to heat up. Because this heat adversely affects the system, the EPS ECU monitors the electric current of the motor. When the EPS ECU detects heat build-up in the motor, it reduces the electric current to the motor gradually to protect the system (motor and EPS ECU), this restricts the power assist operation. The EPS indicator does not come on during this function. When steering torque is not applied to the handlebar, or when the ignition is turned off, and the system cools, the EPS ECU will gradually restore the power assist.

TORQUE SENSOR NEUTRAL POSITION (Torque Sensor Initialization)

The EPS ECU stores the torque sensor neutral position in the EEPROM. The torque sensor must be initialized whenever the EPS unit, the EPS ECU, etc is serviced (page 26-9).

Perform the Torque Sensor Initialization when you service the following components.

MAINTENANCE LOCATION	REPLACEMENT	REMOVAL/ INSTALLATION
Cables and harness around handlebar	INITIALIZE	INITIALIZE
Handlebar	INITIALIZE	INITIALIZE
Steering shaft and steering shaft bushing	INITIALIZE	INITIALIZE
Steering arm and end nut	INITIALIZE	INITIALIZE
EPS unit	INITIALIZE	INITIALIZE
EPS ECU	INITIALIZE	NO NEED

NOTE:

- The torque sensor neutral position is not affected when erasing the DTC.

HOW TO TROUBLESHOOT EPS DTC

1. Question the customer about the conditions when the problem occurred, and try to reproduce the same conditions for troubleshooting. Find out when the EPS indicator came on, such as during EPS control, after EPS control, when the vehicle was at a certain speed, etc.
2. When the EPS indicator does not come on during the test-ride, but troubleshooting is done based on the DTC, check for loose connectors, poor terminal contact, etc., in the affected circuit before you start troubleshooting.
3. After troubleshooting, erase the DTC(s) and test-ride the vehicle to be sure that the EPS indicator does not come on.

MCS INFORMATION

- Refer to the "MCS INFORMATION" in "PGM-FI system" (page 4-13).

DTC READOUT

NOTE:

- If the MCS is not available, DTC can be read from the EPS ECU memory by the EPS indicator blinking pattern (page 26-6).
- After performing diagnostic troubleshooting, erase the DTC(s) (page 26-7) and test-ride the vehicle to be sure that the problem(s) have been removed.

Start the engine and check the EPS indicator [1].

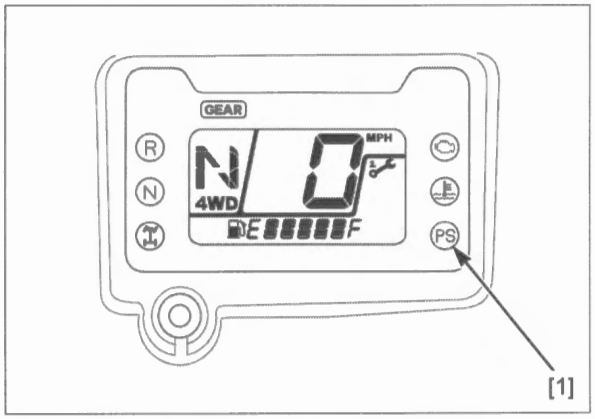
NOTE:

- Under normal conditions, the EPS indicator stays on with the ignition switch is turned ON until the engine starts, and it goes off after starting the engine.

If the EPS indicator stays on or blinks with the engine running, connect the MCS to the DLC (page 4-13).

Read the DTC, stored data and follow the troubleshooting index (page 26-11).

To read the DTC without the MCS, refer to the following procedure.



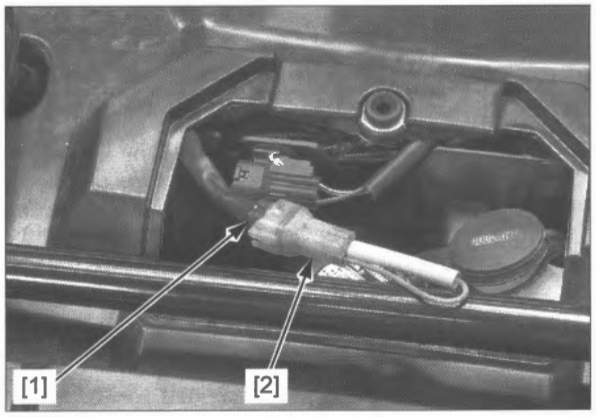
Reading DTC with the EPS indicator

1. Disconnect the DLC (page 4-13).
2. Short the DLC [1] terminals using the special tool.

   TOOL:
   [2] SCS service connector 070PZ-ZY30100

   Connection: Brown/red – Green

3. Turn the ignition switch ON, then read and note the EPS indicator blinks and refer to the troubleshooting index (page 26-11).



EPS Indicator Blinking Pattern

- The number of EPS indicator blinks is the equivalent to the main code of the DTC (the sub-code cannot be displayed by the indicator blinking).
- The indicator has two types of blinks, a long blink and short blink. The long blink lasts for 1.3 seconds, the short blink lasts for 0.3 seconds. One long blink is the equivalent of ten short blinks. For example, when two long blinks are followed by one short blink, the DTC is 21 (two long blinks = 20 blinks, plus one short blink).
- When the EPS ECU stores more than one DTC, the indicator blinks in the order from the lowest number to highest number.

ERASING DTC

NOTE:

- Perform this procedure using a fully charged battery. The EPS indicator will stay lit and the EPS ECU will abort the process if you use a low or dead battery.

How to erase the DTC with MCS

Connect the MCS to the DLC (page 4-13).

Erase the DTC with the MCS while the engine is stopped.

To erase the DTC without MCS, refer to the following procedure.

How to erase the DTC without MCS

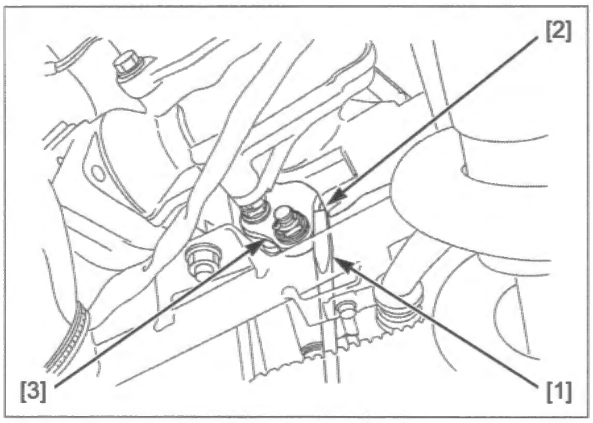
1. Raise the front wheels off the ground and support the vehicle securely.
2. Disconnect the DLC (page 4-13).
3. Short the DLC [1] terminals using the special tool.

   TOOL:
   [2] SCS service connector 070PZ-ZY30100

   Connection: Brown/red – Green



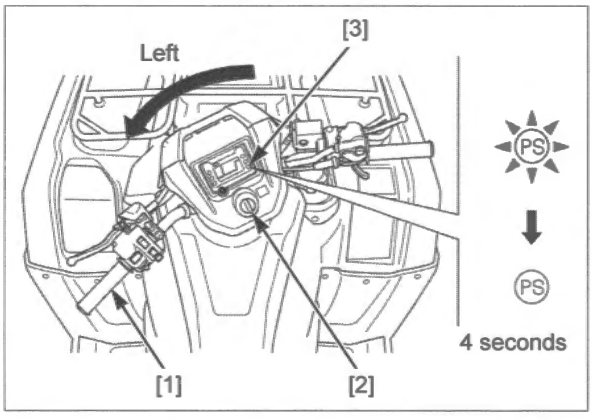
4. Place a 6 mm width screwdriver [1] between the right side of the steering stopper [2] and steering arm [3] as shown.



5. Make sure the engine stop switch is turned "○".

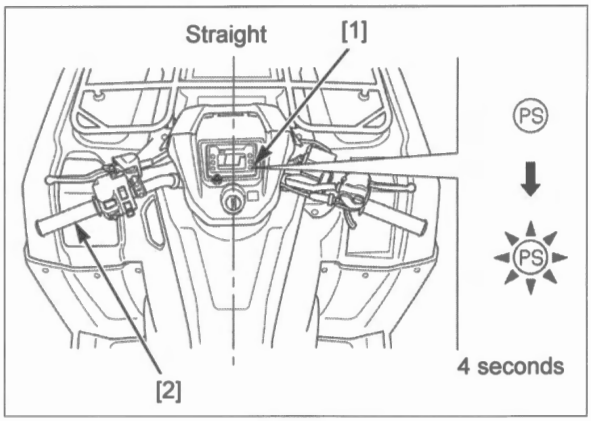
   Fully turn the handlebar [1] to the left to apply a load and hold it firmly.
6. Turn the ignition switch [2] ON.

   The EPS indicator [3] comes on and it goes off after 4 seconds.



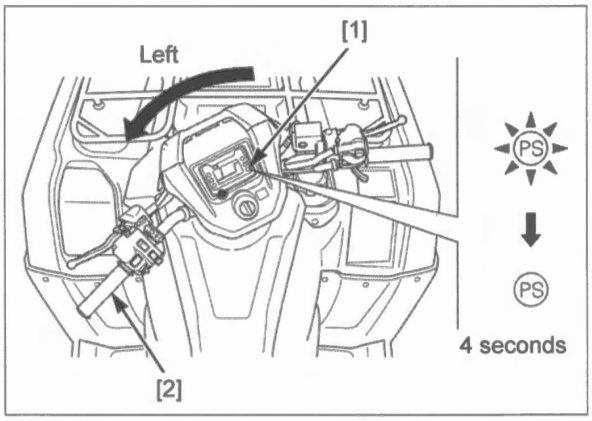
7. Within 4 seconds after the EPS indicator [1] goes off, turn the handlebar [2] in the straight ahead position and release it immediately.

   The EPS indicator comes on again 4 seconds.



8. Within 4 seconds after the EPS indicator [1] comes on, fully turn the handlebar [2] to the left and hold it firmly.

   The EPS indicator goes off after 4 seconds.



9. Within 4 seconds after the EPS indicator [1] goes off, turn the handlebar [2] in the straight ahead position and release it immediately.

   The EPS indicator blinks twice.

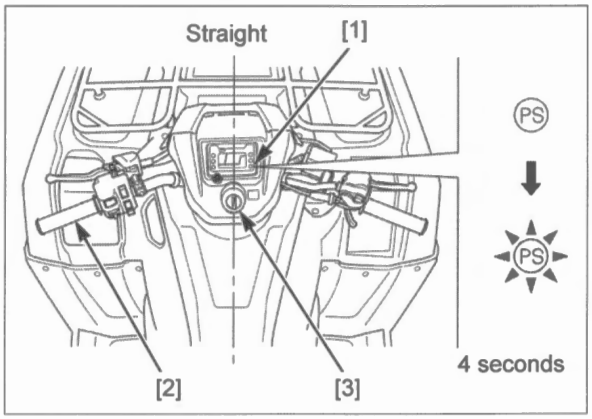
   Turn the ignition switch [3] OFF within 5 seconds after the EPS indicator blinks twice (DTC erasure is completed at this time).

NOTE:

- The ignition switch must be turned OFF at this time. If it is not, the system will be changed to the torque sensor initialization (page 26-10).
- If the EPS indicator does not blink twice, an error was made in the procedure and the DTC was not erased. Turn the ignition switch OFF, and repeat the operation from step 4.

10. Remove the special tool from the DLC and connect the DLC to the accessory socket sub harness 4P (Red) connector.

    Remove the screwdriver inserted in Step 4.



TORQUE SENSOR INITIALIZATION

NOTE:

- Perform this procedure using a fully charged battery. The EPS indicator will stay lit and the EPS ECU will abort the process if you use a low or dead battery.
- The DTC will be erased when initializing the torque sensor.

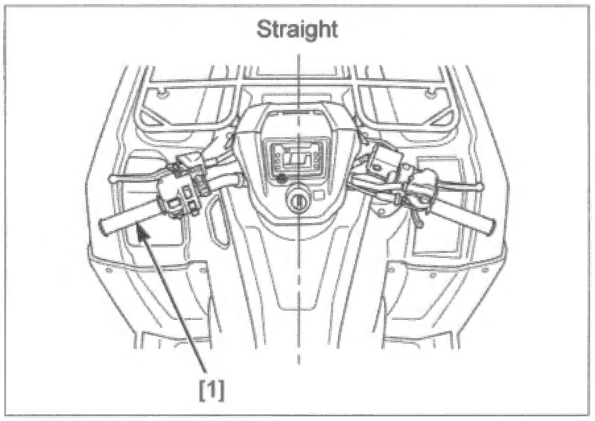
How to Initialize the Torque Sensor with MCS

1. Raise the front wheels off the ground and support the vehicle securely.
2. Connect the MCS to the DLC (page 4-13).
3. Turn the ignition switch ON and engine stop switch "○".

   Turn the handlebar [1] straight ahead.

   Initialize the torque sensor with the MCS while the engine is stopped.

   Follow the instructions on the MCS display.



How to Initialize the Torque Sensor without MCS

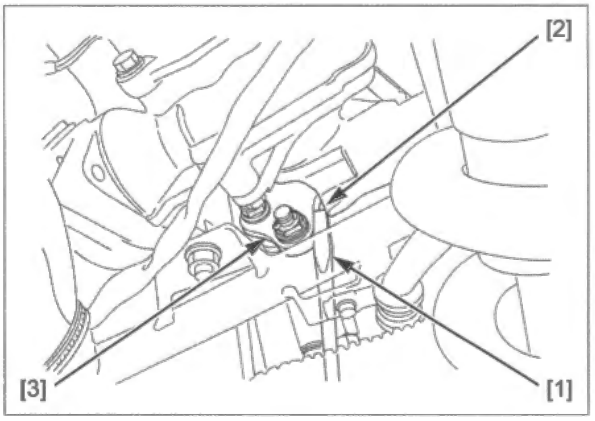
1. Raise the front wheels off the ground and support the vehicle securely.
2. Disconnect the DLC (page 4-13).
3. Short the DLC [1] terminals using the special tool.

   TOOL:
   [2] SCS service connector 070PZ-ZY30100

   Connection: Brown/red – Green



4. Place a 6 mm width screwdriver [1] between the right side of the steering stopper [2] and steering arm [3] as shown.

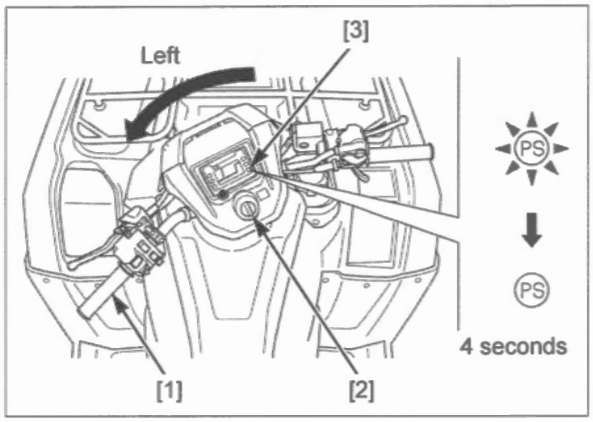


5. Make sure the engine stop switch is turned "○".

   Fully turn the handlebar [1] to the left to apply a load and hold it firmly.

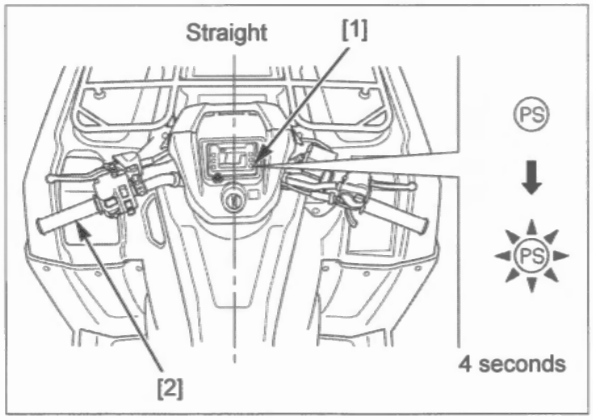
6. Turn the ignition switch [2] ON.

   The EPS indicator [3] comes on and it goes off after 4 seconds.



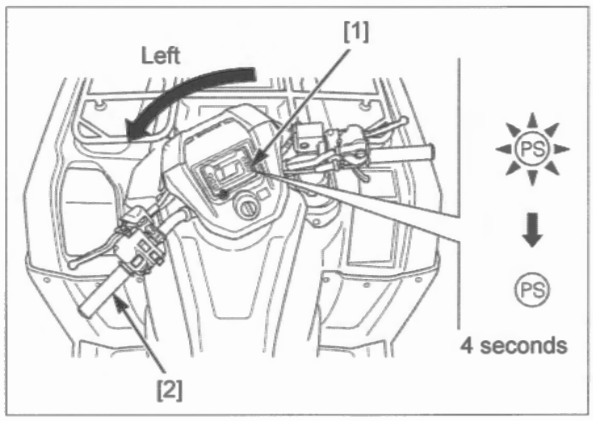
7. Within 4 seconds after the EPS indicator [1] goes off, turn the handlebar [2] in the straight ahead position and release it immediately.

   The EPS indicator comes on for 4 seconds.



8. Within 4 seconds after the EPS indicator [1] comes on, fully turn the handlebar [2] to the left and hold it firmly.

   The EPS indicator goes off after 4 seconds.



9. Turn the handlebar [1] in the straight ahead position (fully turn–to–straight ahead time; within 1 second) and release it immediately after the EPS indicator [2] goes off.

   The EPS indicator blinks twice. Wait for 5 seconds and the EPS indicator blinks 3 times.

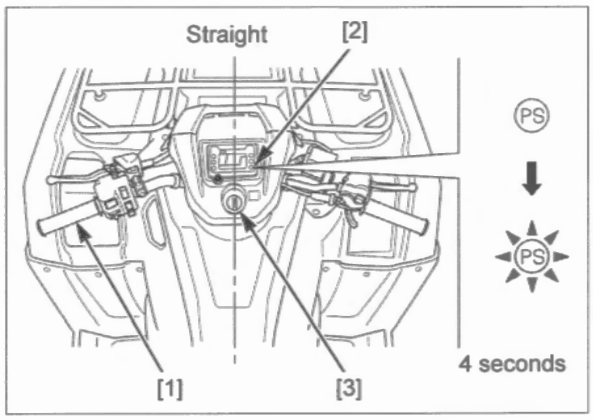
NOTE:

- Do not touch the handlebar after releasing the handlebar.

  Turn the ignition switch [3] OFF after the EPS indicator blinks 3 times (torque sensor initialization is completed at this time).

NOTE:

- If the EPS indicator does not blink 3 times, an error was made in the procedure and the torque sensor was not initialized. Turn the ignition switch OFF, and repeat the operation from step 4.



10. Remove the special tool from the DLC and connect the DLC to the accessory socket sub harness 4P (Red) connector.

    Remove the screwdriver inserted in Step 4.

CIRCUIT INSPECTION

- Refer to the "INSPECTION AT PCM/ECM CONNECTOR" information in "PGM-FI system" (page 4-14).

EPS DTC INDEX

DEFINITIONS

Latch: The EPS indicator turns on and stays on whenever the ignition switch is in the ON position, or until the DTC is erased.

Reset: The EPS indicator turns on when the DTC is set. The EPS indicator will not turn on after the ignition switch is cycled from ON to OFF, but the DTC will be stored in the EPS ECU.

Revest: The EPS indicator turns on when the DTC is set. The EPS indicator will turn off after vehicle has recovered from the fail-safe condition, but the DTC will be stored in the EPS ECU. There was a temporary problem, but the system is now fully operational.

Initial diagnosis: Performed right after the engine starts and until the EPS indicator goes off.

Regular diagnosis: Performed right after the initial diagnosis until the ignition switch is turned OFF.

NOTE:

- If not using the MCS, perform all inspections according to the relevant main code.

DTC	Function Failure	Symptom/Fail-safe function	Detection timing	Type	Refer to
11-01	Excessive change of vehicle speed signal	Indicator ON/Substitution control of the engine rpm	Regular	Revest	26-13
11-02	Comparison between vehicle speed and engine speed signal	Indicator ON/Substitution control of the engine rpm	Regular	Revest	26-14
13-01	EPS ECU internal circuit (Lower FET stuck ON)	Indicator ON/Disables steering assist immediately	Initial	Reset	26-14
13-02	EPS ECU internal circuit (Upper FET stuck ON)	Indicator ON/Disables steering assist immediately	Initial	Reset	26-15
13-03	EPS ECU internal circuit (FET stuck ON <over current>)	Indicator ON/Disables steering assist immediately	Regular	Reset	26-15
13-04	EPS ECU internal circuit (FET stuck ON (VM<Voltage Motor>))	Indicator ON/Disables steering assist immediately	Regular	Reset	26-15
13-05	EPS ECU internal circuit (FET stuck ON (over current<accumulated>))	Indicator ON/Disables steering assist immediately	Regular	Reset	26-16
14-01	EPS ECU internal circuit (Power relay stuck ON)	Indicator ON/Disables steering assist immediately	Regular	Reset	26-16
14-02	EPS ECU internal circuit (Fail-safe relay 1 stuck ON)	Indicator ON/Disables steering assist immediately	Initial	Reset	26-16
14-03	EPS ECU internal circuit (Fail-safe relay 2 stuck ON)	Indicator ON/Disables steering assist immediately	Initial	Reset	26-16
14-04	EPS ECU internal circuit (Power relay stuck open)	Indicator ON/Disables steering assist immediately	Regular	Reset	26-16
15-01	2WD/4WD select signal blinking	Differential lock and 4WD indicators blink (EPS indicator will not come ON)/ 2WD assist power stabilized	Regular	Revest	26-16
15-02	2WD/4WD select signal input line	Indicator ON/2WD assist power stabilized or EPS operation is normally	Regular	Revest	26-17
16-01	EPS ECU internal circuit (Direction determine logic circuit)	Indicator ON/Disables steering assist immediately	Regular	Reset	26-18
16-02	EPS ECU internal circuit (INH output circuit)	Indicator ON/Disables steering assist immediately	Initial	Reset	26-18
17-01	EPS ECU internal circuit (Voltage raise transformation circuit)	Indicator ON/Disables steering assist immediately	Initial	Reset	26-18
17-02	EPS ECU internal circuit (Voltage raise transformation circuit)	Indicator ON/Disables steering assist under the Specified condition	Regular	Reset	26-18
18-01	EPS ECU internal circuit (Current sensor)	Indicator ON/Disables steering assist immediately	Initial	Reset	26-18
18-02	EPS ECU internal circuit (Current sensor off set)	Indicator ON/Disables steering assist immediately	Regular	Reset	26-18
18-03	EPS ECU internal circuit (Current sensor stuck low)	Indicator ON/Disables steering assist immediately	Initial	Reset	26-19
18-04	EPS ECU internal circuit (Current sensor stuck low)	Indicator ON/Disables steering assist immediately	Regular	Reset	26-20
18-05	EPS ECU internal circuit (Motor current deflection)	Indicator ON/Disables steering assist immediately	Regular	Reset	26-18

DTC	Function Failure	Symptom/Fail-safe function	Detection timing	Type	Refer to
18-06	EPS ECU internal circuit (IM2)	Indicator ON/Disables steering assist immediately	Regular	Reset	26-18
21-01	Abnormal motor terminal voltage	Indicator ON/Disables steering assist immediately	Initial	Reset	26-20
21-02	Abnormal motor terminal voltage	Indicator ON/Disables steering assist immediately	Regular	Reset	26-20
21-03	Open in the motor harness	Indicator ON/Disables steering assist immediately	Regular	Reset	26-20
22-01	Failure to initialize the torque sensor	Indicator blink/Disables steering assist until the torque sensor is initialized	Regular	Latch*	26-20
23-01	Low/high voltage for the torque sensor (VT1 and VT2)	Indicator ON/Disables steering assist until the DTC is erased	Regular	Latch	26-21
23-02	Torque sensor (VT3 Differential-amplification Function)	Indicator ON/Disables steering assist until the DTC is erased	Regular	Latch	26-23
23-03	Torque sensor (VT1, VT2 rapid change)	Indicator ON/Disables steering assist until the DTC is erased	Regular	Latch	26-24
23-04	Torque sensor (Temperature sensor)	Indicator ON/Disables steering assist immediately	Regular	Reset	26-24
23-05	Torque sensor (Sensor Coil)	Indicator ON/Disables steering assist until the DTC is erased	Regular	Latch	26-24
24-01	Engine speed signal	Indicator ON/Disables steering assist under the Specified condition	Regular	Revest	26-24
31-01	Low/high IG1-terminal voltage	Indicator ON/Disables steering assist under the Specified condition	Initial	Revest	26-25
31-02	Low/high IG1-terminal voltage	Indicator ON/Disables steering assist under the Specified condition	Regular	Revest	26-25
32-01	Low/high VBU voltage	Indicator ON/Disables steering assist under the Specified condition	Regular	Reset	26-26
33-02	EPS ECU internal circuit (EEPROM)	Indicator ON/Disables steering assist immediately	Initial	Reset	26-18
35-01	EPS ECU internal circuit (CPU)	Indicator ON/Disables steering assist immediately	Initial and Regular	Reset	26-18
35-03	EPS ECU internal circuit (CPU communication)	Indicator ON/Disables steering assist immediately	Initial	Reset	26-18
35-04	EPS ECU internal circuit (CPU communication)	Indicator ON/Disables steering assist under the Specified condition	Regular	Reset	26-18

*The stored DTC is erased by performing the torque sensor initialization.

DTC TROUBLESHOOTING

NOTE:

- After troubleshooting, erase the DTC(s) and test-ride the vehicle to be sure that the EPS indicator does not come on.

VERIFY PROPER CONNECTOR CONTACT

Many EPS problems and subsequent DTCs are caused by poor connector contacts. The first step in troubleshooting any DTC is to inspect the affected connectors.

CONNECTOR INSPECTION

- Check for moisture in the affected connector
- Check for corrosion
- Check for folded pins on the male side of the connector
- Check for loose pins and/or pins pushed out of the connector

DTC 11-01: EXCESSIVE CHANGE OF VEHICLE SPEED SIGNAL (REGULAR DIAGNOSIS)

NOTE:

- Before starting the troubleshooting, check for loose or poor contact of the following connectors, and recheck the EPS indicator (page 26-13).
  - engine sub-wire harness connector
    - 3P (Black): FM1, FM2
    - 6P (Black): FE1, FE2
  - EPS ECU 21P (Gray)
  - VS sensor 3P (Black)
- The system is reducing the assist power, the EPS indicator will come on when the EPS ECU detects conditions of DTC 11-01 and DTC 11-02.

1. VS Sensor Signal line Open Circuit Inspection

Disconnect the VS sensor 3P (Black) connector (page 25-30) and EPS ECU 21P (Gray) connector (page 26-30).

Check for continuity between the wire harness side VS sensor 3P (Black) connector [1] and EPS ECU 21P (Gray) connector [2] terminals.

Connection: C17 – Pink

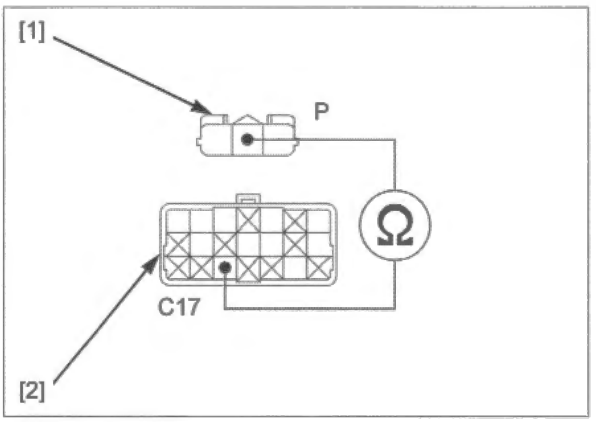
TOOL:

Pin Probe Male (2 pack) **07ZAJ-RDJA110**

Is there continuity?

YES – GO TO STEP 2.

NO – Open circuit in the Pink or Pink/green wire.



2. VS Sensor Signal line Short Circuit Inspection

Check for continuity between the wire harness side EPS ECU 21P (Gray) connector [1] terminal and ground.

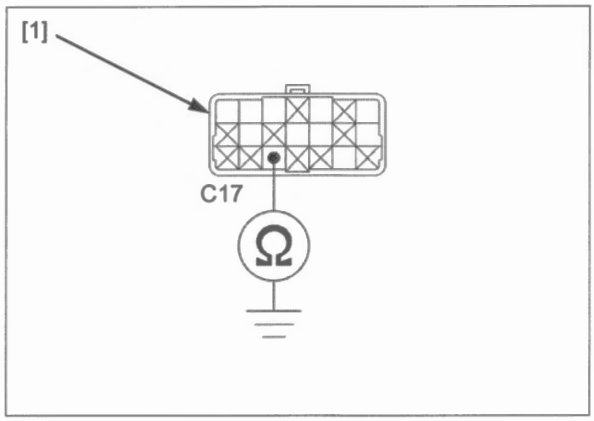
Connection: C17 – Ground

TOOL:
Pin Probe Male (2 pack) 07ZAJ-RDJA110

Is there continuity?

YES – Short circuit in the Pink/green or Pink wire.

NO – Replace the EPS ECU with a known good one (page 26-30), and recheck.



DTC 11-02: COMPARISON BETWEEN VEHICLE SPEED AND ENGINE SPEED SIGNAL (REGULAR DIAGNOSIS)

Refer to DTC 11-01 (page 26-13)

DTC 13-01: EPS ECU INTERNAL CIRCUIT (LOWER FET STUCK ON) (INITIAL DIAGNOSIS)

NOTE:

- Before starting the troubleshooting, check for loose or poor contact of the following connectors.
  – EPS ECU 21P (Gray)
  – EPS motor 2P (Gray)

1. EPS ECU System Inspection

1. Erase the DTC (page 26-7).
2. Start the engine.
3. Fully turn the handlebar to the left or right and hold it 10 seconds.
4. Check the EPS indicator.

Does the EPS indicator come on?

YES – GO TO STEP 2.

NO – Intermittent failure.

2. Motor Line Short Circuit Inspection

Disconnect the EPS ECU 2P (Gray) connector (page 26-30).

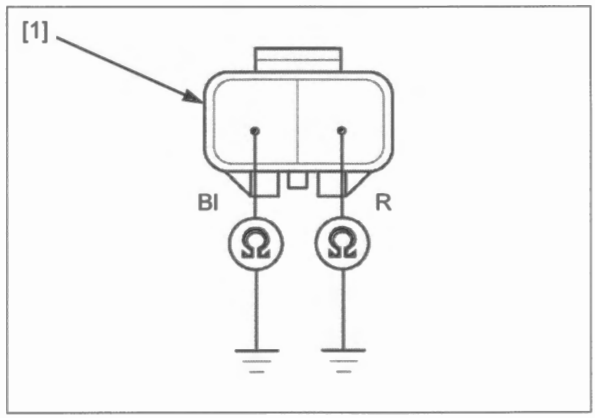
Check for continuity between the wire harness side EPS ECU 2P (Gray) connector [1] terminals and ground.

Connection: Black – Ground
Red – Ground

Is there continuity?

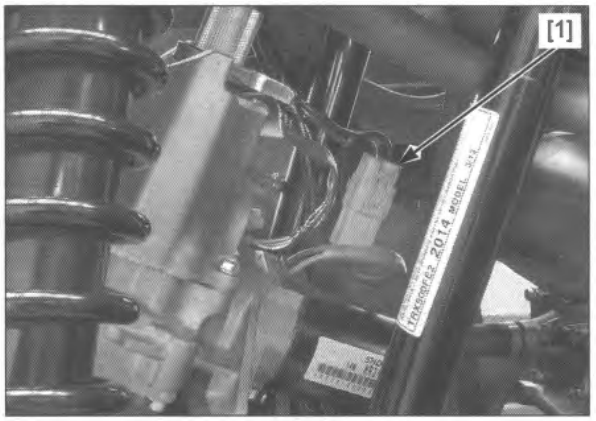
YES – GO TO STEP 3.

NO – GO TO STEP 4.



3. Motor Short Circuit Inspection

Disconnect the EPS motor 2P (Gray) connector [1].



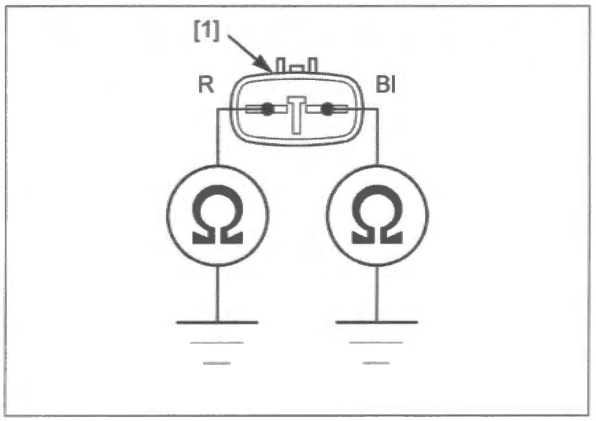
Check for continuity between the motor side 2P connector [1] terminals and ground.

Connection: Red – Ground
Black – Ground

Is there continuity?

YES – Replace the EPS unit with a new one (page 18-28), and recheck.

NO – Short circuit in the Red or Black wire.



4. EPS sub-wire harness Short Circuit Inspection

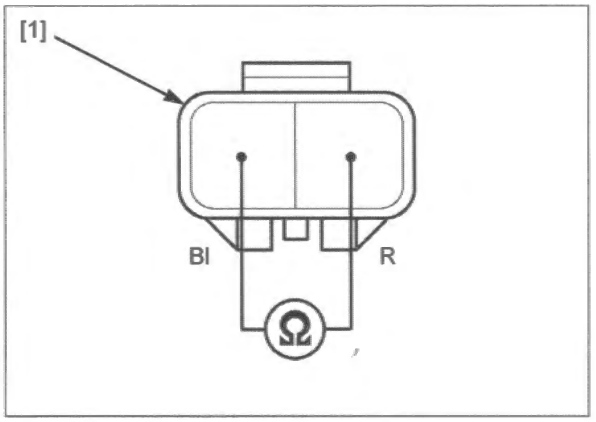
Check for continuity between the wire harness side EPS ECU 2P (Gray) connector [1] terminals.

Connection: Black – Red

Is there continuity?

YES – Short circuit in the EPS sub-wire harness.

NO – Recheck for loose or poor contact on the EPS ECU 2P (Gray) connector and EPS motor 2P (Gray) connector. If they are OK, replace the EPS ECU with a new one (page 26-30).



DTC 13-02: EPS ECU INTERNAL CIRCUIT (UPPER FET STUCK ON) (INITIAL DIAGNOSIS)

Refer to DTC 13-01 (page 26-14)

DTC 13-03: EPS ECU INTERNAL CIRCUIT (FET STUCK ON <OVER CURRENT>) (REGULAR DIAGNOSIS)

Refer to DTC 13-01 (page 26-14)

DTC 13-04: EPS ECU INTERNAL CIRCUIT (FET STUCK ON (VM<VOLTAGE MOTOR>) (REGULAR DIAGNOSIS)

Refer to DTC 13-01 (page 26-14)

DTC 13-05: EPS ECU INTERNAL CIRCUIT (FET STUCK ON (OVER CURRENT<ACCUMULATED>) (REGULAR DIAGNOSIS)

Refer to DTC 13-01 (page 26-14)

DTC 14-01: EPS ECU INTERNAL CIRCUIT (POWER RELAY STUCK ON) (REGULAR DIAGNOSIS)

Refer to DTC 13-01 (page 26-14)

DTC 14-02: EPS ECU INTERNAL CIRCUIT (FAIL-SAFE RELAY 1 STUCK ON) (INITIAL DIAGNOSIS)

Refer to DTC 13-01 (page 26-14)

DTC 14-03: EPS ECU INTERNAL CIRCUIT (FAIL-SAFE RELAY 2 STUCK ON) (INITIAL DIAGNOSIS)

Refer to DTC 13-01 (page 26-14)

DTC 14-04: EPS ECU INTERNAL CIRCUIT (POWER RELAY STUCK OPEN) (REGULAR DIAGNOSIS)

Refer to DTC 13-01 (page 26-14)

DTC 15-01: 2WD/4WD SELECT SIGNAL BLINKING (REGULAR DIAGNOSIS)

NOTE:

- Before starting the troubleshooting, check for loose or poor contact of the following connectors, and recheck the 4WD indicator (page 26-13).
  - PCM/ECM 33P (Gray)
  - EPS ECU 21P (Gray)
  - combination meter 16P (Gray)
- When this problem occurs, there are some of problem of differential lock system.
- Question the customer about the conditions when the problem occurred, and try to reproduce the same conditions for troubleshooting. Find out when the 4WD indicator blinked, such as during 4WD-to-2WD selecting, 2WD-to-4WD selecting, at what speed, etc.

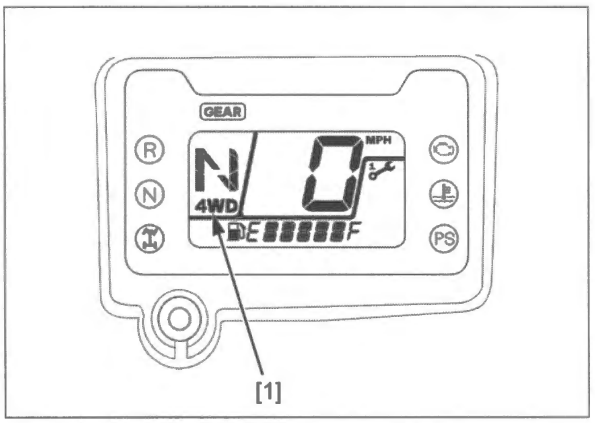
1. EPS ECU System Inspection

Erase the DTC (page 26-7).
Perform the test-ride and check the 4WD indicator [1].

Does the 4WD indicator blinking?

YES – Check the differential lock DTC (page 21-13).

NO – • Intermittent failure.
• Loose or poor contact of the following connectors:
– PCM/ECM 33P (Gray)
– EPS ECU 21P (Gray)
– combination meter 16P (Gray)



DTC 15-02: 2WD/4WD SELECT SIGNAL INPUT LINE (REGULAR DIAGNOSIS)

NOTE:
- Question the customer about the conditions when the problem occurred, and try to reproduce the same conditions for troubleshooting. Find out when the 4WD indicator blinked, such as during 4WD-to-2WD selecting, 2WD-to-4WD selecting, at what speed, etc.

1. EPS ECU System Inspection

Erase the DTC (page 26-7).
Start the engine and check the EPS indicator.

Does the indicator come on?

YES – GO TO STEP 2.

NO – Intermittent failure.

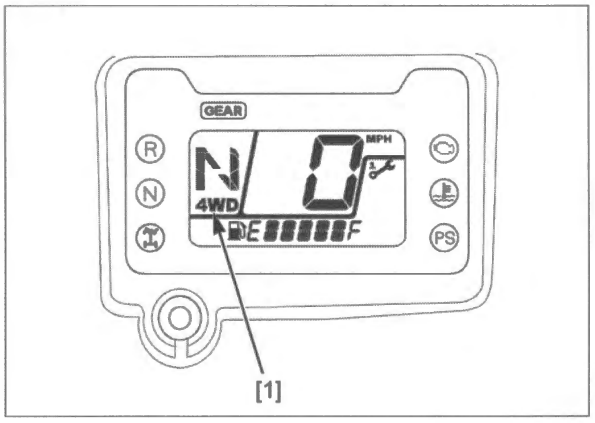
2. 4WD Indicator Inspection

Turn the ignition switch ON and engine stop switch "○".
Shift the drive mode from 2WD to 4WD and from 4WD to 2WD several times and check the 4WD indicator [1].

Is the 4WD indicator operated normally?

YES – Replace the EPS ECU with a known good one (page 26-30), and recheck.

NO – Inspect the actuator switch (page 21-21).



DTC 16-01, 16-02, 17-01, 17-02, 18-01, 18-02, 18-05, 18-06, 33-02, 35-01, 35-03, or 35-04: EPS ECU INTERNAL CIRCUIT

Perform the troubleshooting according to the DTC in the following table.

16-01	**EPS ECU internal circuit (Direction determine logic circuit) (Regular diagnosis)**
16-02	**EPS ECU internal circuit (INH output circuit) (Initial diagnosis)**
17-01	**EPS ECU internal circuit (Voltage raise transformation circuit) (Initial diagnosis)**
17-02	**EPS ECU internal circuit (Voltage raise transformation circuit) (Regular diagnosis)**
18-01	**EPS ECU internal circuit (Current sensor) (Initial diagnosis)**
18-02	**EPS ECU internal circuit (Current sensor off set) (Regular diagnosis)**
18-05	**EPS ECU internal circuit (Motor current deflection) (Regular diagnosis)**
18-06	**EPS ECU internal circuit (IM2) (Regular diagnosis)**
33-02	**EPS ECU internal circuit (EEPROM) (Regular diagnosis)**
35-01	**EPS ECU internal circuit (CPU) (Initial and regular diagnosis)**
35-03	**EPS ECU internal circuit (CPU communication) (Initial diagnosis)**
35-04	**EPS ECU internal circuit (CPU communication) (Regular diagnosis)**

1. EPS ECU System Inspection

1. Erase the DTC (page 26-7).
2. Start the engine.
3. Fully turn the handlebar to the left or right and hold it for 10 seconds.
4. Check the EPS indicator.

Does the EPS indicator come on?

YES – GO TO STEP 2.

NO – Intermittent failure.

2. DTC Inspection

1. Check the DTC (page 26-6).

Is DTC 16-01, 16-02, 17-01, 17-02, 18-01, 18-02, 18-05, 18-06, 33-02, 35-01, 35-03 or 35-04 indicated?

YES – Replace the EPS ECU with a known good one (page 26-30), and recheck.

NO – Perform the troubleshooting for the indicated DTC (page 26-11).

DTC 18-03: EPS ECU INTERNAL CIRCUIT (CURRENT SENSOR STUCK LOW) (INITIAL DIAGNOSIS)

NOTE:

- Before starting the troubleshooting, check for loose or poor contact of the following connectors.
  - EPS ECU 2P (Gray)
  - EPS motor 2P (Gray)

1. EPS ECU System Inspection

1. Erase the DTC (page 26-7).
2. Start the engine.
3. Fully turn the handlebar to the left or right and hold it for 10 seconds.
4. Check the EPS indicator.

Does the EPS indicator come on?

YES – GO TO STEP 2.

NO – Intermittent failure.

2. Motor Line Open Circuit Inspection

Disconnect the EPS ECU 2P (Gray) connector (page 26-30).

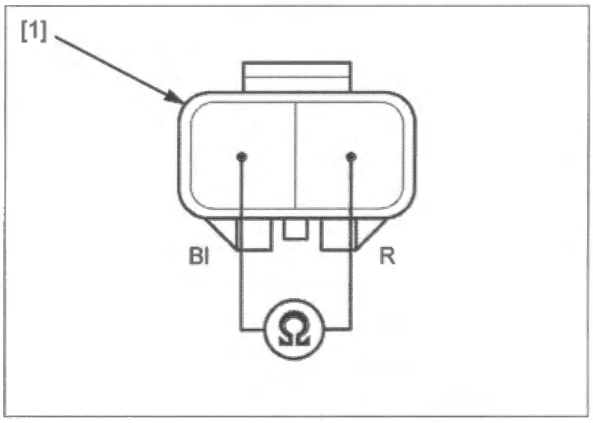
Check for continuity between the wire harness side EPS ECU 2P (Gray) connector [1] terminals.

Connection: Black – Red

Is there continuity?

YES – Replace the EPS ECU with a known good one (page 26-30), and recheck.

NO – GO TO STEP 3.



3. Motor Open Circuit Inspection

Disconnect the EPS motor 2P (Gray) connector (page 26-15).

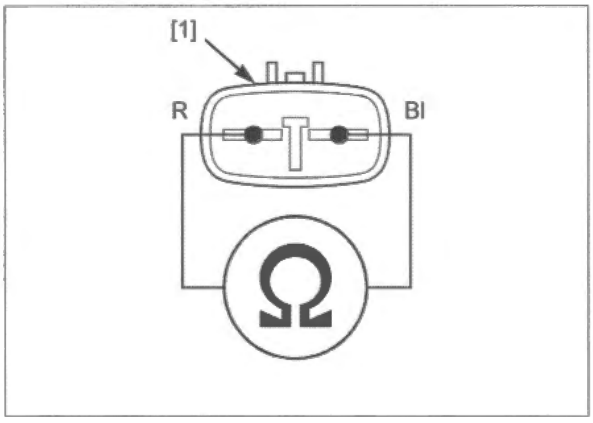
Check for continuity between the motor side 2P connector [1] terminals.

Connection: Red – Black

Is there continuity?

YES – Open circuit in the EPS sub-wire harness.

NO – Replace the EPS unit with a new one (page 18-28), and recheck.



DTC 18-04: EPS ECU INTERNAL CIRCUIT (CURRENT SENSOR STUCK LOW) (REGULAR DIAGNOSIS)

Refer to DTC 18-03 (page 26-19)

DTC 21-01: ABNORMAL MOTOR TERMINAL VOLTAGE (INITIAL DIAGNOSIS)

Refer to DTC 18-03 (page 26-19)

DTC 21-02: ABNORMAL MOTOR TERMINAL VOLTAGE (REGULAR DIAGNOSIS)

Refer to DTC 18-03 (page 26-19)

DTC 21-03: OPEN IN THE MOTOR HARNESS (REGULAR DIAGNOSIS)

Refer to DTC 18-03 (page 26-19)

DTC 22-01: FAILURE TO INITIALIZE THE TORQUE SENSOR (INITIAL DIAGNOSIS)

NOTE:

- The EPS ECU stores the torque sensor neutral position. The torque sensor must be initialized whenever the EPS unit, the EPS ECU, etc is serviced (page 26-9).
- Refer to torque sensor neutral position information for detail of the initialization parts (page 26-6).
- The DTC will not store in the EPS ECU. (The stored DTC is erased by performing the torque sensor initialization) (page 26-9)
- The torque sensor neutral position is not effected when erasing the DTC.

1. **Initializing Torque Sensor**

   Perform the torque sensor initialization (page 26-9) and check the EPS indicator.

   Does the EPS indicator come on?

   YES – Check the DTC (page 26-6) and perform the troubleshooting for the indicated DTC (page 26-11).

   NO – Intermittent failure.

DTC 23-01: LOW/HIGH VOLTAGE FOR THE TORQUE SENSOR (VT1 AND VT2) (REGULAR DIAGNOSIS)

NOTE:

- Before starting the troubleshooting, check for loose or poor contact of the following connectors.
  - EPS ECU 21P (Gray)
  - torque sensor 3P (Gray)

1. EPS ECU System Inspection

1. Erase the DTC (page 26-7).
2. Start the engine.
3. Fully turn the handlebar to the left or right and hold it for 10 seconds.
4. Check the EPS indicator.

Does the EPS indicator come on?

YES – GO TO STEP 2.

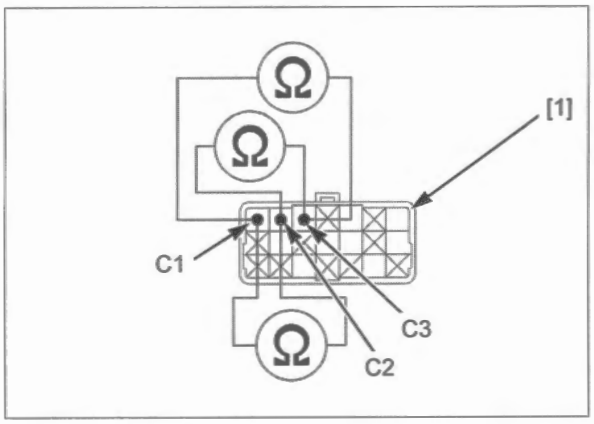
NO – Intermittent failure.

2. Torque Sensor Line Short Circuit Inspection

Disconnect the EPS ECU 21P (Gray) connector (page 26-30).

Measure the resistance between the wire harness side EPS ECU 21P (Gray) connector [1] terminals.

Connection: C1 – C2
C1 – C3
C2 – C3



TOOL:
Pin Probe Male (2 pack) 07ZAJ-RDJA110

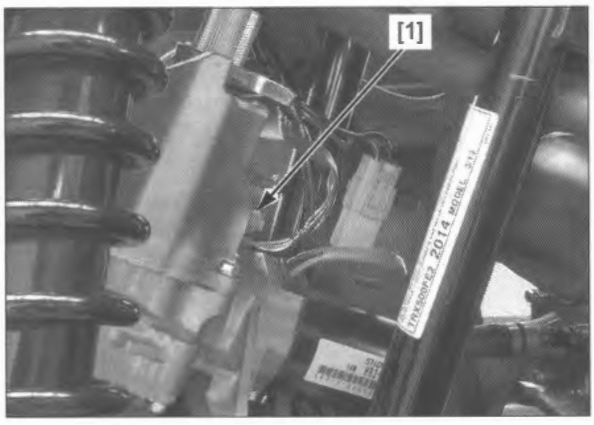
Is the resistance less than 10 Ω (at 20°C/68°F)?

YES – GO TO STEP 3.

NO – GO TO STEP 4.

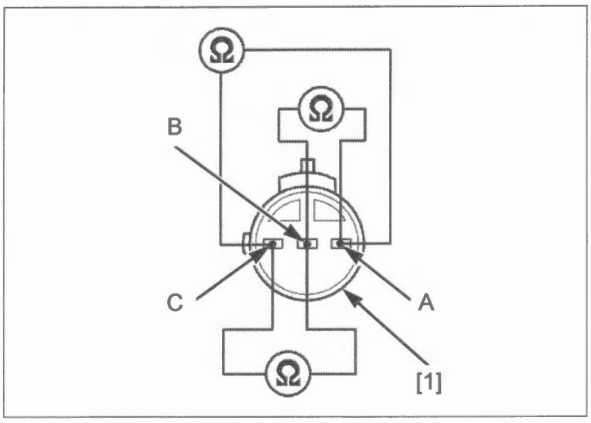
3. Torque Sensor Coil Short Circuit Inspection

Disconnect the torque sensor 3P (Gray) connector [1].



Measure the resistance between the torque sensor side connector [1] terminals in the EPS unit.

Connection: A – B
A – C
B – C



Is the resistance less than 10 Ω (at 20°C/68°F)?

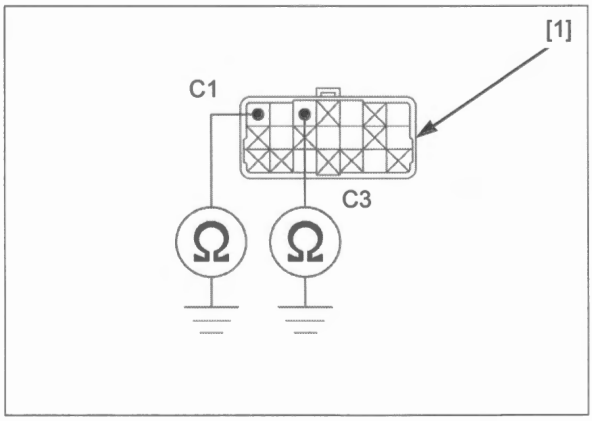
YES – Replace the EPS unit with a new one (page 18-28), and recheck (short circuit in the torque sensor coil).

NO – • Short circuit in the Yellow/red or Green/orange wire.
• Short circuit in the Yellow/red or White/blue wire.
• Short circuit in the Green/orange or White/blue wire.

4. Torque Sensor Line and Ground Short Circuit Inspection

Check for continuity between the wire harness side EPS ECU 21P (Gray) connector [1] terminals and ground.

Connection: C1 – Ground
C3 – Ground



TOOL:
Pin Probe Male (2 pack) **07ZAJ-RDJA110**

Is there continuity?

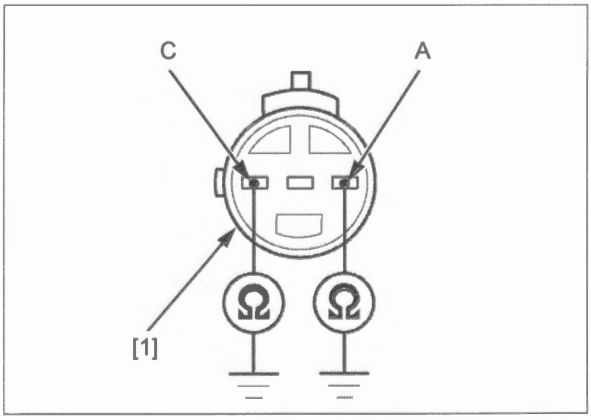
YES – GO TO STEP 5.

NO – GO TO STEP 6.

5. Torque Sensor Coil Short Circuit Inspection

Check for continuity between the torque sensor side connector [1] terminals in the EPS unit and ground.

Connection: A – Ground
C – Ground



Is there continuity?

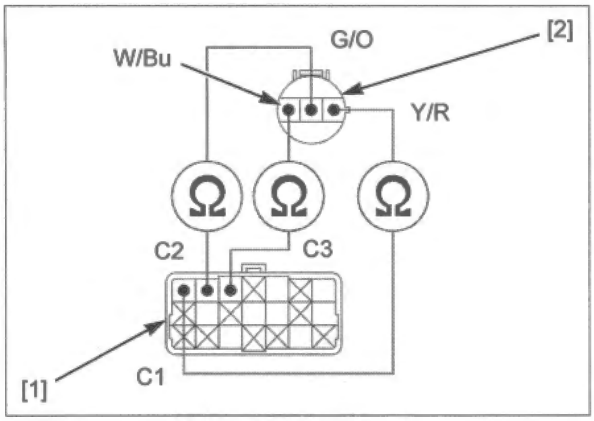
YES – Replace the EPS unit with a new one (page 18-28), and recheck (short circuit in the torque sensor coil).

NO – • Short circuit in the Yellow/red wire.
• Short circuit in the White/blue wire.

6. Torque Sensor Line Open Circuit Inspection

Check for continuity between the wire harness side EPS ECU 21P (Gray) connector [1] and torque sensor 3P (Gray) connector [2] terminals.

Connection: C1 – Yellow/red
C2 – Green/orange
C3 – White/blue



TOOL:
Pin Probe Male (2 pack) 07ZAJ-RDJA110

Is there continuity?

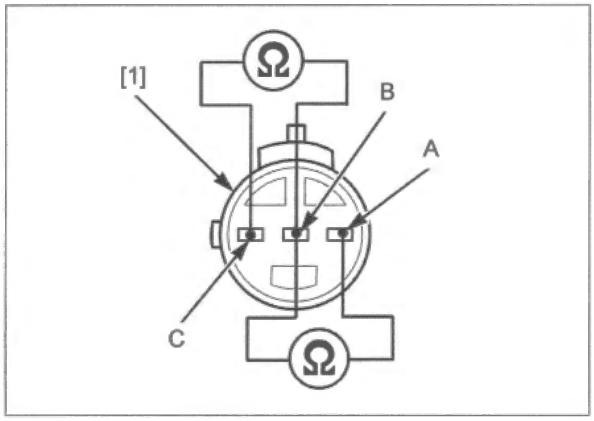
YES – GO TO STEP 7.

NO – • Open circuit in the Yellow/red wire.
• Open circuit in the Green/orange wire.
• Open circuit in the White/blue wire.

7. Torque Sensor Open Circuit Inspection

Measure the resistance between the torque sensor side connector [1] terminals in the EPS unit.

Connection: A – B
B – C



Is the resistance within 10 – 40 Ω (20°C/68°F)?

YES – Replace the EPS ECU with a known good one (page 26-30), and recheck.

NO – Replace the EPS unit with a new one (page 18-28), and recheck (short circuit in the torque sensor coil).

DTC 23-02: TORQUE SENSOR (VT3 DIFFERENTIAL AMPLIFICATION FUNCTION) (REGULAR DIAGNOSIS)

NOTE:
- Before starting the troubleshooting, check for loose or poor contact of the following connectors.
  – EPS ECU 21P (Gray)
  – torque sensor 3P (Gray)

1. EPS ECU System Inspection

1. Erase the DTC (page 26-7).
2. Start the engine.
3. Fully turn the handlebar to the left or right and hold it for 10 seconds.
4. Check the EPS indicator.

Does the EPS indicator come on?

YES – GO TO STEP 2.

NO – Intermittent failure.

2. Recheck DTC

Check the DTC (page 26-6).

Is DTC 23-02 indicated?

YES – Replace the EPS ECU with a known good one (page 26-30), and recheck.

NO – Perform the troubleshooting for the indicated DTC (page 26-11).

DTC 23-03: TORQUE SENSOR (VT1, VT2 RAPID CHANGE) (REGULAR DIAGNOSIS)

Refer to DTC 23-01 (page 26-21).

DTC 23-04: TORQUE SENSOR (TEMPERATURE SENSOR) (REGULAR DIAGNOSIS)

Refer to DTC 23-01 (page 26-21).

DTC 23-05: TORQUE SENSOR (SENSOR COIL) (REGULAR DIAGNOSIS)

Refer to DTC 23-01 (page 26-21).

DTC 24-01: ENGINE SPEED SIGNAL (REGULAR DIAGNOSIS)

NOTE:

- Before starting the troubleshooting, check for loose or poor contact of the following connectors, and recheck the EPS indicator (page 26-13).
  - EPS ECU 21P (Gray)
  - PCM/ECM 33P (Black)

1. CKP Sensor Signal Line Open Circuit Inspection

Disconnect the EPS ECU 21P (Gray) connector (page 26-30) and PCM/ECM 33P (Black) connector (page 4-45).

Check for continuity between the wire harness side EPS ECU 21P (Gray) connector [1] and PCM/ECM 33P (Black) connector [2] terminals.

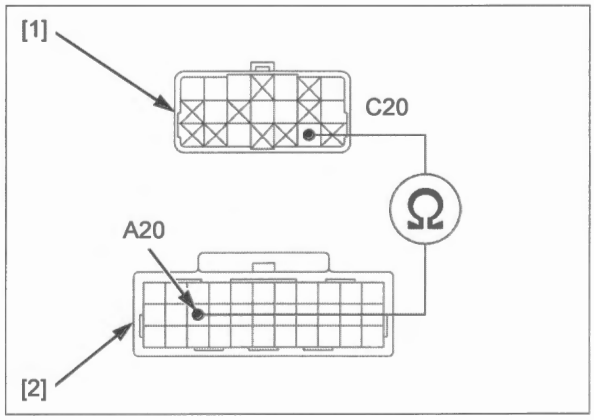
Connection: C20 (EPS ECU) – A20 (PCM/ECM)

TOOL:
Pin Probe Male (2 pack) **07ZAJ-RDJA110**

Is there continuity?

YES – GO TO STEP 2.

NO – Open circuit in the Blue/black wire.



2. CKP Sensor Signal Line Short Circuit Inspection

Check for continuity between the wire harness side EPS ECU 21P (Gray) connector [1] terminal and ground.

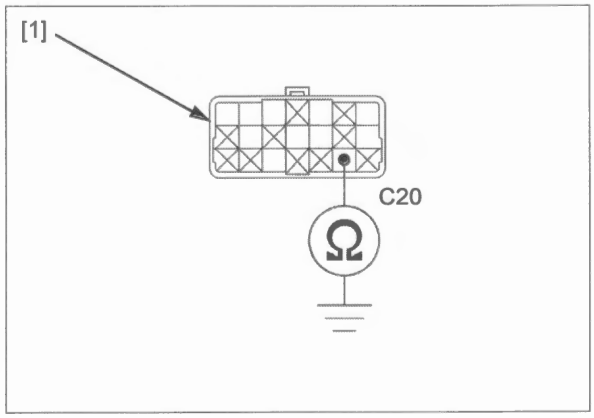
Connection: C20 – Ground

TOOL:
Pin Probe Male (2 pack) **07ZAJ-RDJA110**

Is there continuity?

YES – Short circuit in the Blue/black wire.

NO – Replace the EPS ECU with a known good one (page 26-30), and recheck.



DTC 31-01: LOW/HIGH IG1-TERMINAL VOLTAGE (INITIAL DIAGNOSIS)

NOTE:

Before starting the troubleshooting, check the following items:

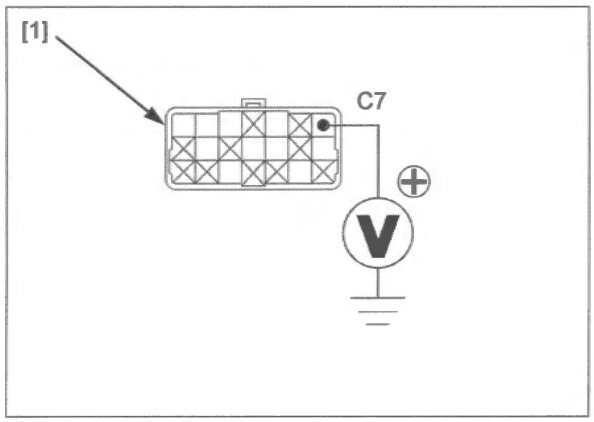
- check for loose or poor contact on the EPS ECU 21P (Gray) connector, and recheck the EPS indicator (page 26-13).
- check for blown IGN fuse (10 A)
- battery condition (must use a fully charged battery) (page 23-5)

1. IG1 Line Open Circuit Inspection

Disconnect the EPS ECU 21P (Gray) connector (page 26-30).
Turn the ignition switch ON and engine stop switch "○".

Measure the voltage between the wire harness side EPS ECU 21P (Gray) connector [1] terminal and ground.

Connection: C7 (+) – Ground (–)



TOOL:
Pin Probe Male (2 pack) 07ZAJ-RDJA110

Is there battery voltage?

YES – GO TO STEP 2.

NO – Open circuit in the Black/red wire.

2. Battery Inspection

Perform the Battery/Charging System troubleshooting (page 23-3).

Is the battery and charging system in good condition?

YES – Replace the EPS ECU with a known good one (page 26-30), and recheck.

NO – Repair the battery/charging system (page 23-5).

DTC 31-02: LOW/HIGH IG1-TERMINAL VOLTAGE (REGULAR DIAGNOSIS)

Refer to DTC 31-01 (page 26-25)

DTC 32-01: LOW/HIGH VBU VOLTAGE (REGULAR DIAGNOSIS)

NOTE:

Before starting the troubleshooting, check the following items:

- check for loose or poor contact on the EPS ECU 2P (Brown) connector, and recheck the EPS indicator (page 26-13).
- check for blown EPS fuse (40 A) and IGN fuse (10 A)
- battery condition (must use a fully charged battery) (page 23-5)

1. EPS ECU +B Line Open Circuit Inspection

Disconnect the EPS ECU 2P (Brown) connector (page 26-30).
Turn the ignition switch ON and engine stop switch "".

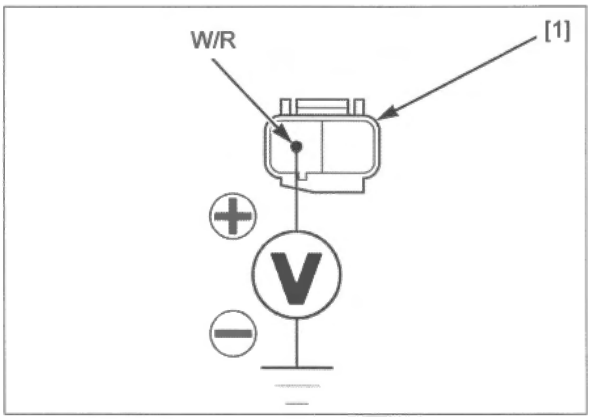
Measure the voltage between the wire harness side EPS ECU 2P (Brown) connector [1] terminal and ground.

Connection: White/red (+) – Ground (–)

Is there battery voltage?

YES – GO TO STEP 2.

NO – Open circuit in the White/red wire.



2. Battery Inspection

Perform the Battery/Charging System troubleshooting (page 23-3).

Is the battery and charging system in good condition?

YES – Replace the EPS ECU with a known good one (page 26-30), and recheck.

NO – Repair the battery/charging system (page 23-5).

EPS INDICATOR CIRCUIT INSPECTION

EPS INDICATOR DOES NOT COME ON

NOTE:

- Under normal conditions, the EPS indicator comes on when the ignition switch is turned ON, then goes off after starting the engine.
- Before starting the troubleshooting, check for loose or poor contact on the combination meter 16P (Gray) connector and EPS ECU 21P (Gray) connector, and recheck the EPS indicator.

1. **Combination Meter Inspection**

   Check that the combination meter functions properly.

   Does the combination function properly?

   YES – GO TO STEP 2.

   NO – Perform the combination meter inspection (page 24-7).

2. **Indicator Operation Check (Short Circuit inspection)**

   Disconnect the EPS ECU 21P (Gray) connector (page 26-30).
   Turn the ignition switch ON and engine stop switch "○".

   Check the EPS indicator.

   Does the indicator come on?

   YES – Recheck for loose or poor contact on the combination meter 16P (Gray) connector and EPS ECU 21P (Gray) connector. If they are OK, replace the EPS ECU with a known good one (page 26-30), and recheck.

   NO – GO TO STEP 3.

3. **Indicator Line Short Circuit inspection**

   Disconnect the combination meter 16P (Gray) connector (page 24-11).

   Check the for continuity between the wire harness side combination meter 16P (Gray) connector [1] terminal and ground.

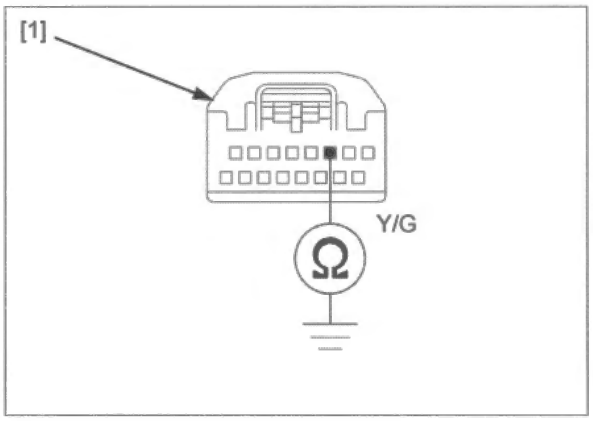
   Connection: Yellow/green – Ground

   TOOL:
   Pin Probe Male (2 pack) **07ZAJ-RDJA110**

   Is there continuity?

   YES – Short circuit in the Yellow/green wire.

   NO – Recheck for loose or poor contact on the combination meter 16P (Gray) connector and EPS ECU 21P (Gray) connector. If they are OK, replace the combination meter with a known good one (page 24-7).



EPS INDICATOR DOES NOT GO OFF, AND NO DTCs ARE STORED

NOTE:

- Under normal conditions, the EPS indicator comes on when the ignition switch is turned ON, then goes off after starting the engine.
- Before starting the troubleshooting check the following items:
  - check for loose or poor contact of the following connectors, and recheck the EPS indicator.
    - EPS ECU 21P (Gray)
    - EPS ECU 2P (Brown)
    - combination meter 16P (Gray)
  - check for blown ES fuse (30 A) and IGN fuse (20 A)
  - battery condition (must use a fully charged battery) (page 23-5)

1. **Fuse Inspection**

   Check the ES fuse (30 A) and IGN fuse (20 A).

   Is the fuse OK?

   YES – GO TO STEP 2.

   NO – Replace the fuse and recheck. If the fuse is blown, check for short to ground in this fuse circuit.

2. **Recheck DTC**

   Check the DTC (page 26-6).

   Are there any DTCs?

   YES – Perform the troubleshooting for the indicated DTC (page 26-11).

   NO – GO TO STEP 3.

3. **Indicator Operation Check (Open Circuit Inspection)**

   Disconnect the EPS ECU 21P (Gray) connector (page 26-30).
   Ground the wire harness side EPS ECU 21P (Gray) connector [1] terminal with a jumper wire.

   Connection: C5 – Ground

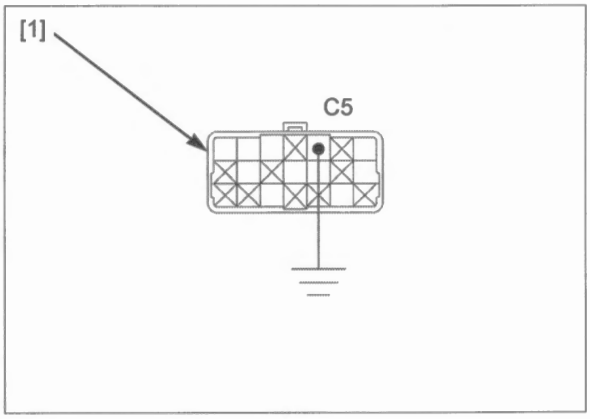
   TOOL:
   Pin Probe Male (2 pack) **07ZAJ-RDJA110**

   Turn the ignition switch ON and engine stop switch "⟳".
   Check the EPS indicator.

   Does the indicator go off?

   YES – Recheck for loose or poor contact on the EPS ECU 21P (Gray) connector. If they are OK, replace the EPS ECU with a known good one (page 26-30), and recheck.

   NO – GO TO STEP 4.



4. Indicator Line Open Circuit Inspection

Disconnect the combination meter 16P (Gray) connector (page 26-30).

Check for continuity between the wire harness side combination meter 16P (Gray) connector [1] and EPS ECU 21P (Gray) connector [2] terminals.

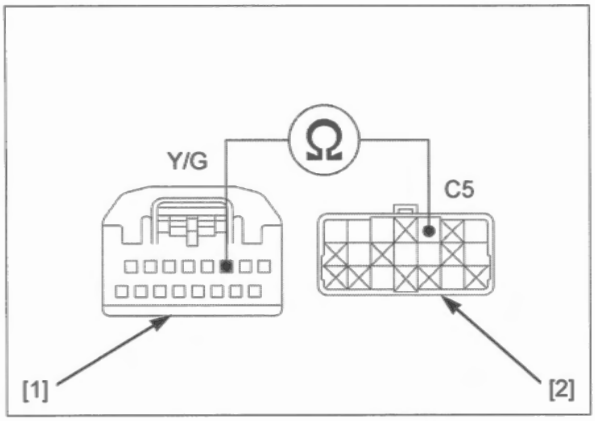
Connection: C5 – Yellow/green

TOOL:
Pin Probe Male (2 pack) **07ZAJ-RDJA110**

Is there continuity?

YES – GO TO STEP 5.

NO – Open circuit in the Yellow/green wire.



5. SCS Line Short Circuit Inspection

Disconnect the PCM/ECM 33P (Gray) connector (page 4-45).

Check for continuity between the wire harness side EPS ECU 21P (Gray) connector [1] terminal and ground.

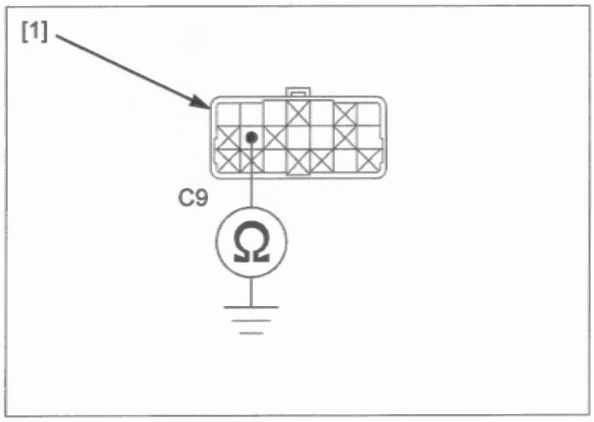
Connection: C9 – Ground

TOOL:
Pin Probe Male (2 pack) **07ZAJ-RDJA110**

Is there continuity?

YES – Short circuit in the Brown/red wire between the EPS ECU and DLC.

NO – GO TO STEP 6.



6. IG1 Line Open Circuit Inspection

Turn the ignition switch ON and engine stop switch "○".

Measure the voltage between the wire harness side EPS ECU 21P (Gray) connector [1] terminal and ground.

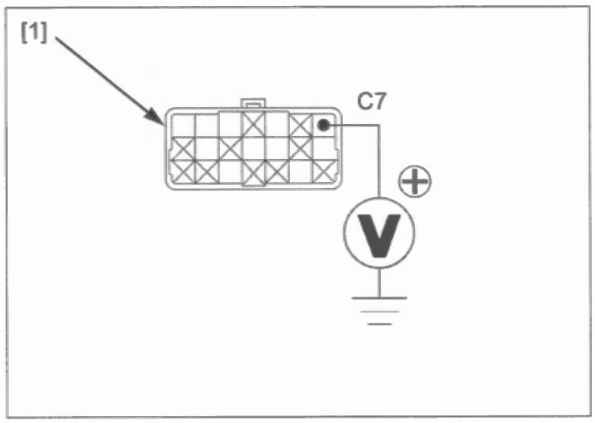
Connection: C7 – Ground (–)

TOOL:
Pin Probe Male (2 pack) **07ZAJ-RDJA110**

Is there battery voltage?

YES – GO TO STEP 7.

NO – Open circuit in the Black/red wire.



7. EPS ECU +B Line Open Circuit Inspection

Turn the ignition switch OFF.
Disconnect the EPS ECU 2P (Brown) connector (page 26-30).

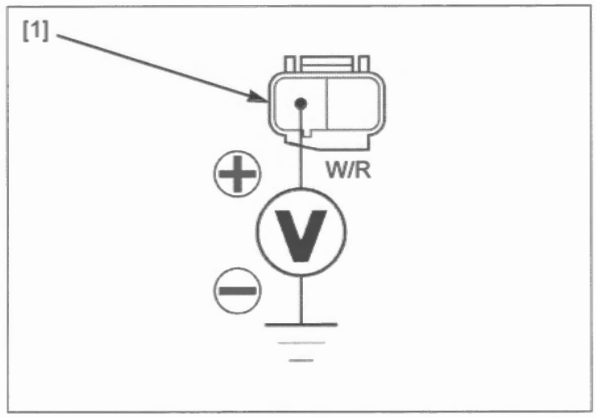
Measure the voltage between the wire harness side EPS ECU 2P (Brown) connector [1] terminal and ground.

Connection: White/red (+) – Ground (–)

Is there battery voltage?

YES – GO TO STEP 8.

NO – Open circuit in the White/red wire.



8. EPS ECU PG Line Open Circuit Inspection

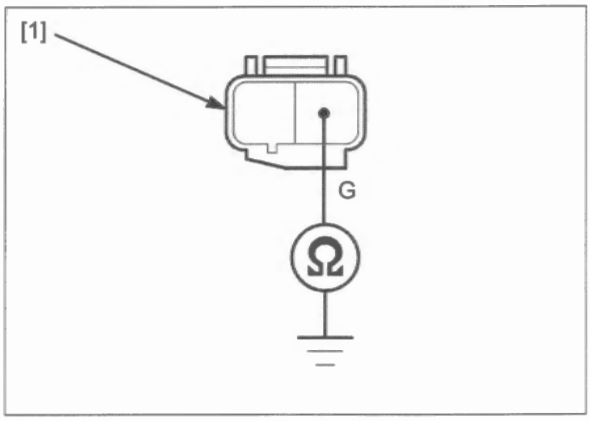
Check for continuity between the wire harness side EPS ECU 2P (Brown) connector [1] terminal and ground.

Connection: Green – Ground

Is there continuity?

YES – GO TO STEP 9.

NO – Open circuit in the Green wire.



9. Battery Inspection

Perform the Battery/Charging System troubleshooting (page 23-3).

Is the battery and charging system in good condition?

YES – Recheck for loose or poor contact on the combination meter 16P (Gray) connector, EPS ECU 21P (Gray) connector and EPS ECU 2P (Brown). If they are OK, replace the EPS ECU with a known good one (page 26-30), and recheck.

NO – Repair the battery/charging system (page 23-5).

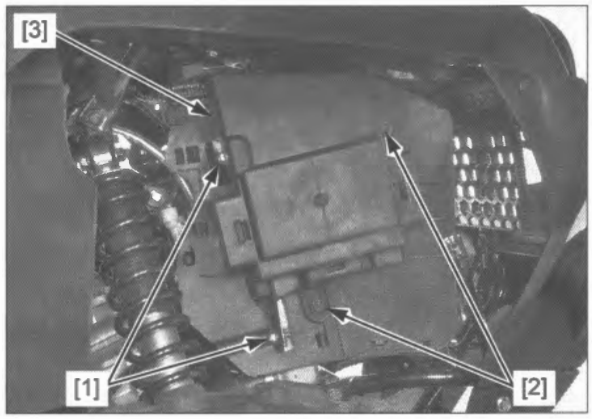
EPS ECU

REMOVAL/INSTALLATION

Remove the right headlight (page 24-5).

Turn the ignition switch OFF.

Remove the setting bolts [1], trim clips [2] and EPS ECU holder [3].



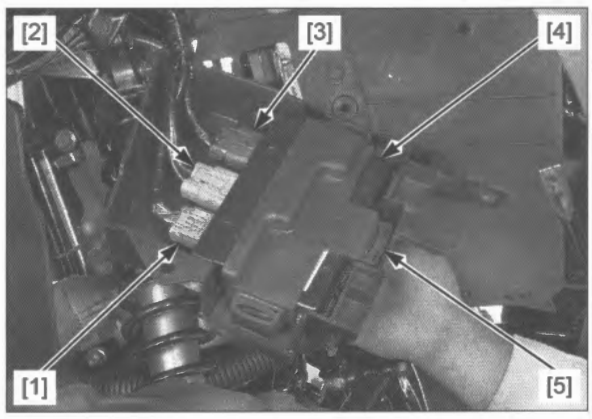
Disconnect the following connectors:

- EPS ECU 21P (Gray) [1]
- EPS ECU 2P (Gray) [2]
- EPS ECU 2P (Brown) [3]

Remove the EPS ECU [4] from the EPS ECU holder. Remove the EPS ECU from the cushion [5].

Installation is in the reverse order of removal.

Perform the torque sensor initialization if the EPS ECU replaced (page 26-9).



27. WIRING DIAGRAMS

FM1 model ('14) 27-2

FM1 model ('15 – '19) 27-3

FM1 model ('20 – '21) 27-4

FM1 model (After '21) 27-5

FE1 model ('14) 27-6

FE1 model (After '14) 27-7

FM2 model ('14) 27-8

FM2 model ('15 – '19) 27-9

FM2 model ('20 – '21)/
FM6 model ('20 – '21) 27-10

FM2 model (After '21)/
FM6 model (After '21) 27-11

FE2 model ('14) 27-12

FE2 model ('15 – '19) 27-13

FE2 model ('20 – '21) 27-14

FE2 model (After '21) 27-15

FM5 model (After '14) 27-16

FM6 model ('15 – '19)/
FM7 model (After '14) 27-17

FA5 model ('15 – '19) 27-18

FA5 model ('20 – '21) 27-19

FA5 model ('22 –'23) 27-20

FA5 model (After '23) 27-21

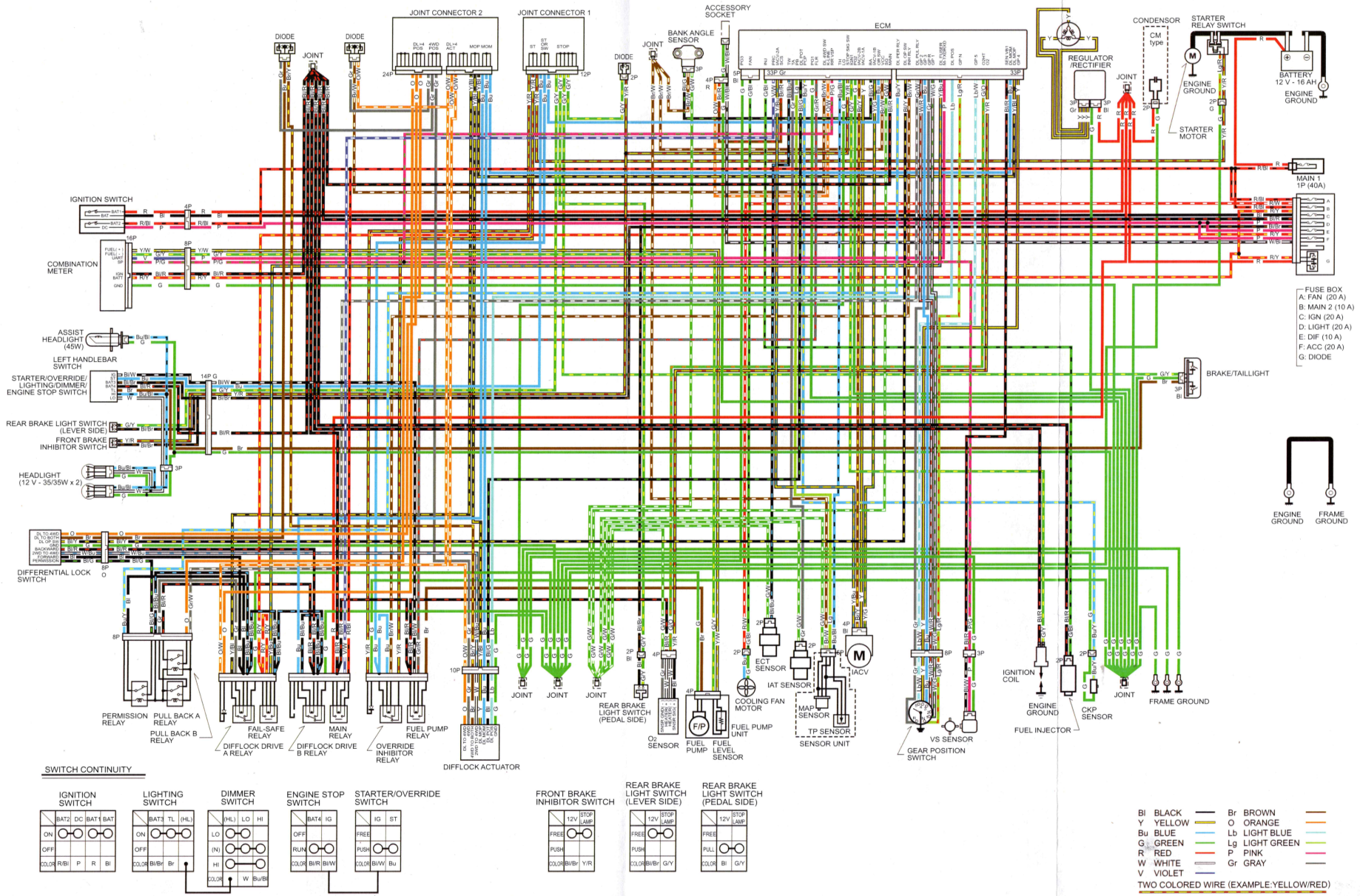
FA6 model ('15 – '19)/
FA7 model ('15 – '19) 27-22

FA6 model ('20 – '21)/
FA7 model ('20 – '21) 27-23

FA6 model (After '21)/
FA7 model (After '21) 27-24

FA6 model (After '23)/
FA7 model (After '23) 27-25

FM1 model ('14)



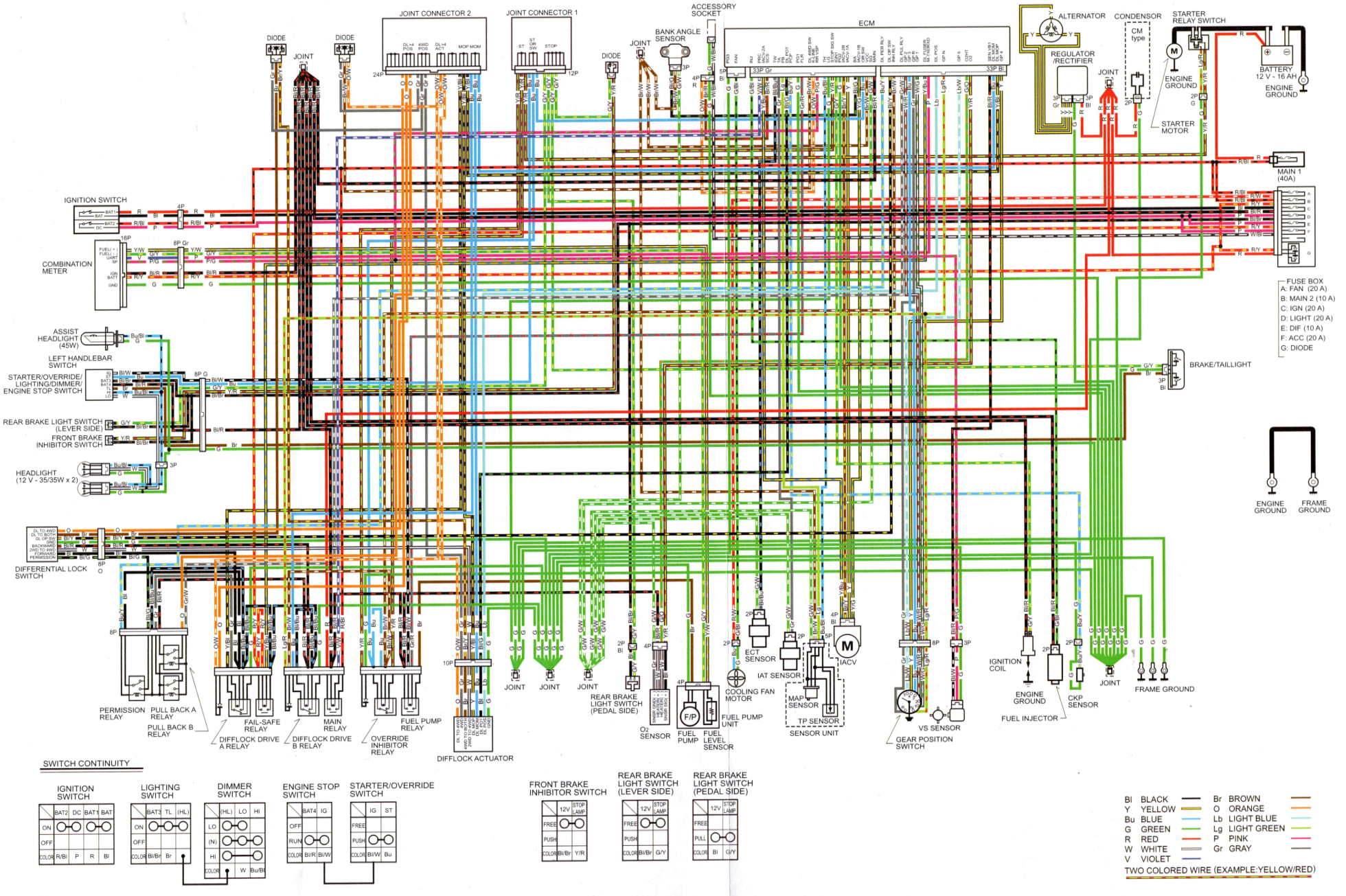
SWITCH CONTINUITY

Bl	BLACK	Br	BROWN
Y	YELLOW	O	ORANGE
Bu	BLUE	Lb	LIGHT BLUE
G	GREEN	Lg	LIGHT GREEN
R	RED	P	PINK
W	WHITE	Gr	GRAY
V	VIOLET		

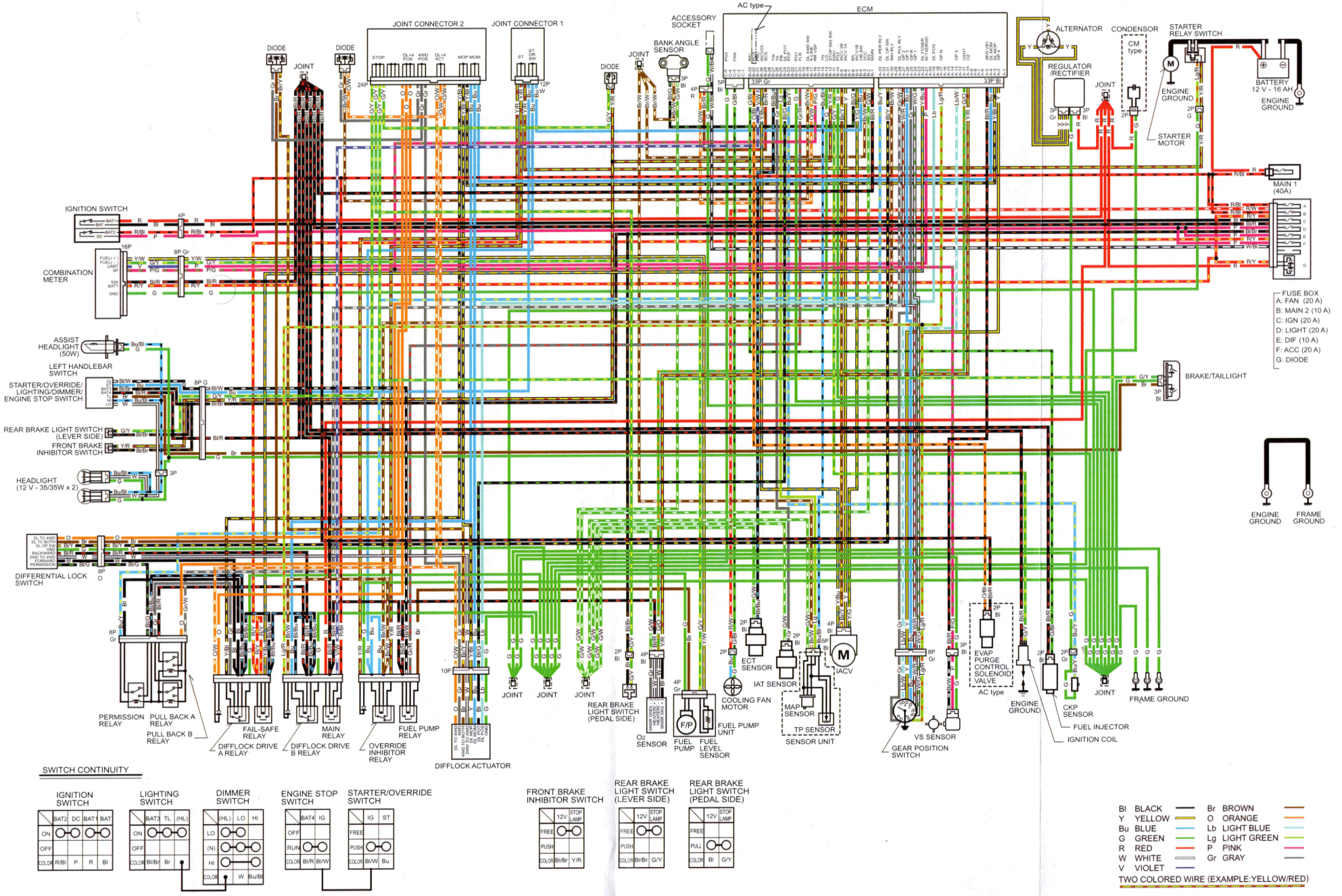
TWO COLORED WIRE (EXAMPLE:YELLOW/RED)

61HR409

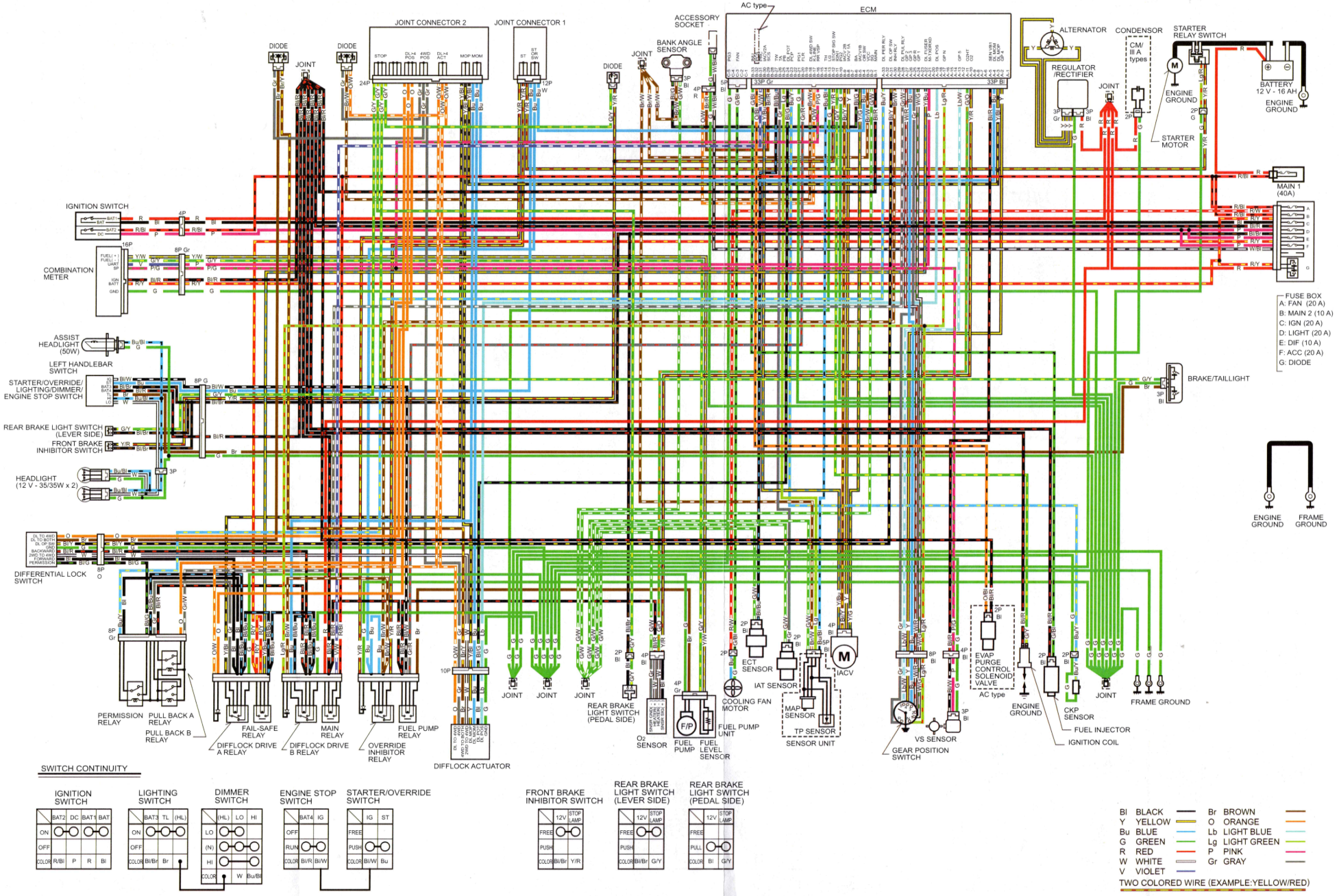
FM1 model ('15 – '19)



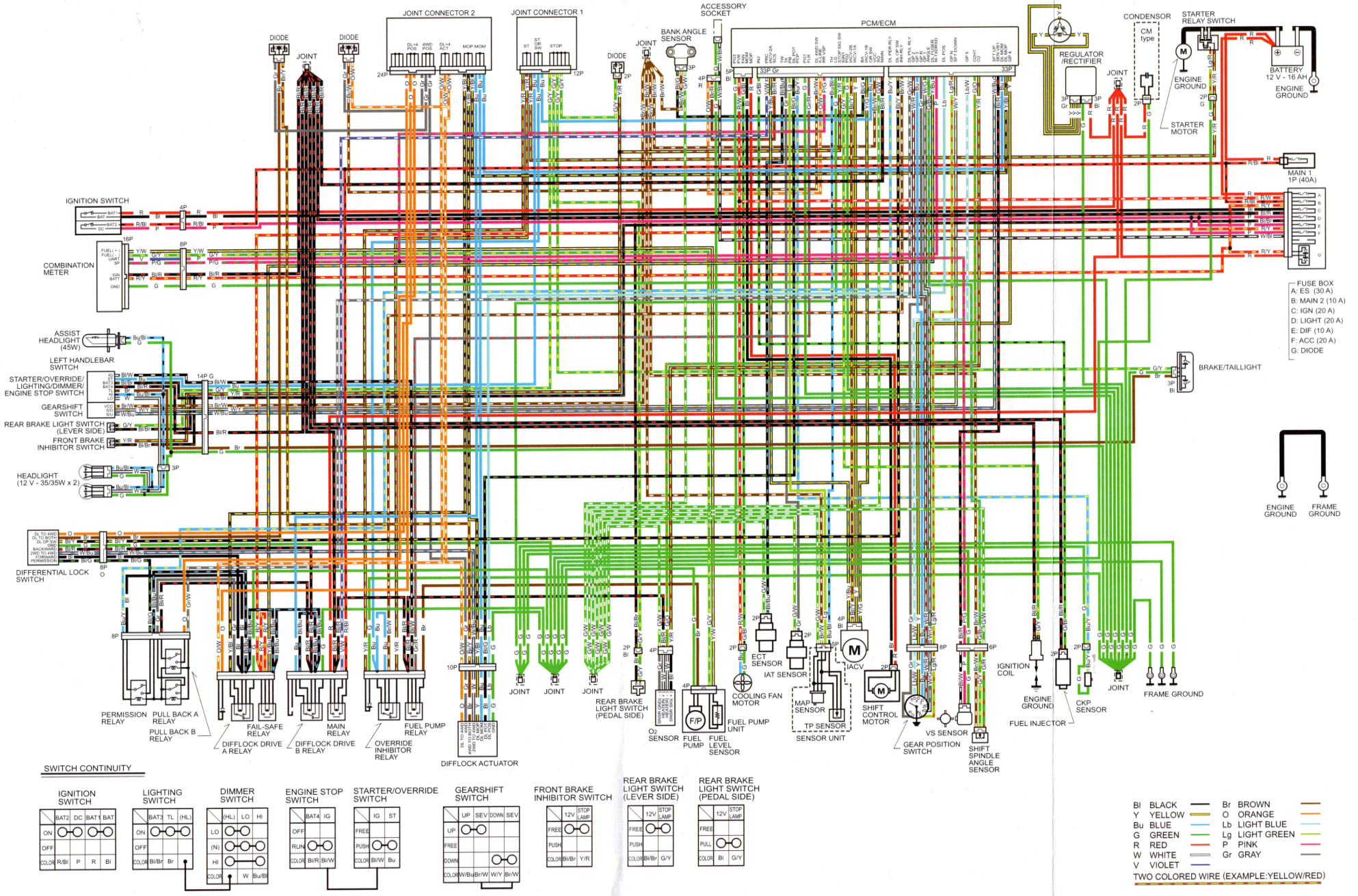
FM1 model ('20 – '21)



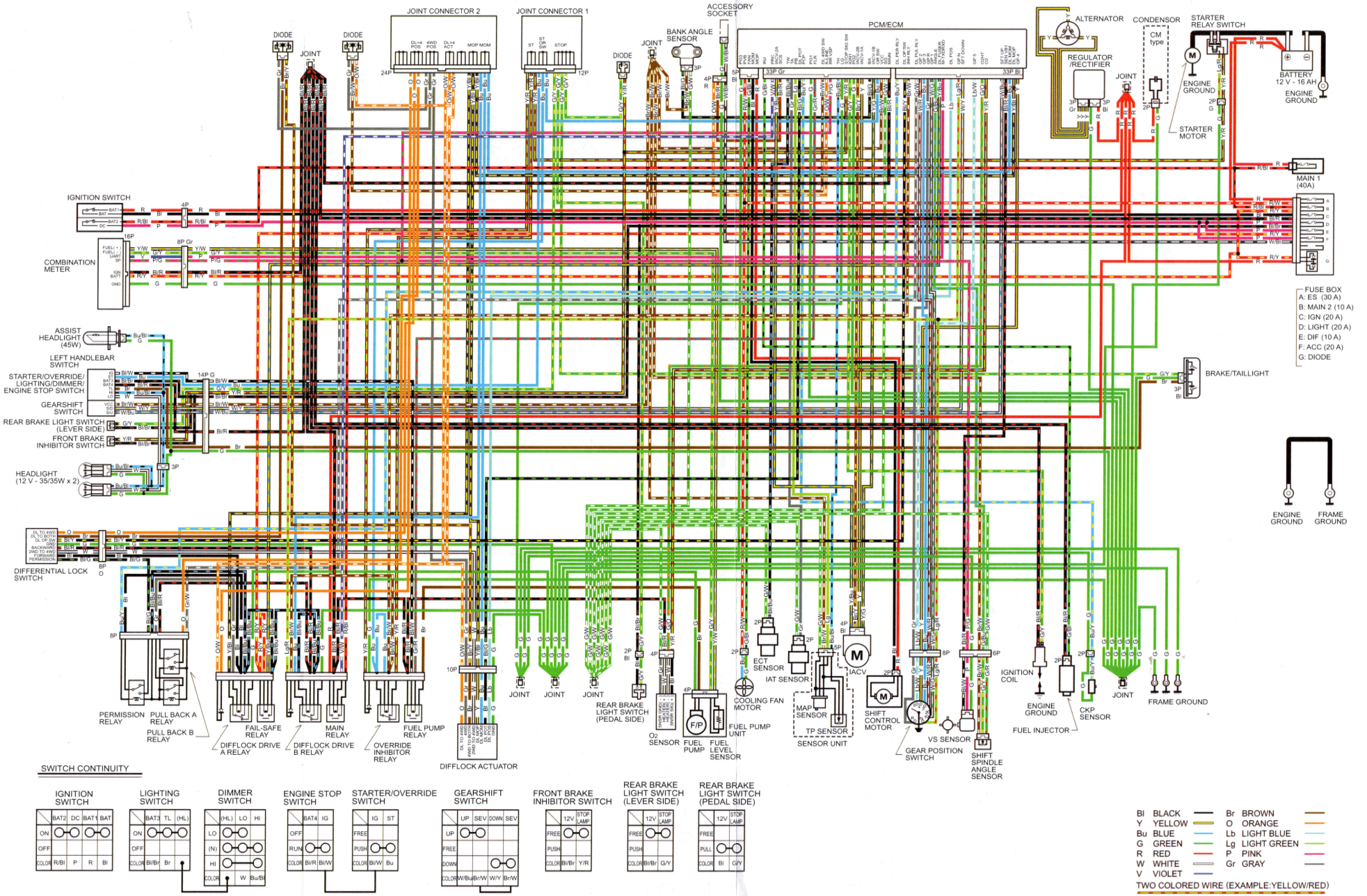
FM1 model (After '21)



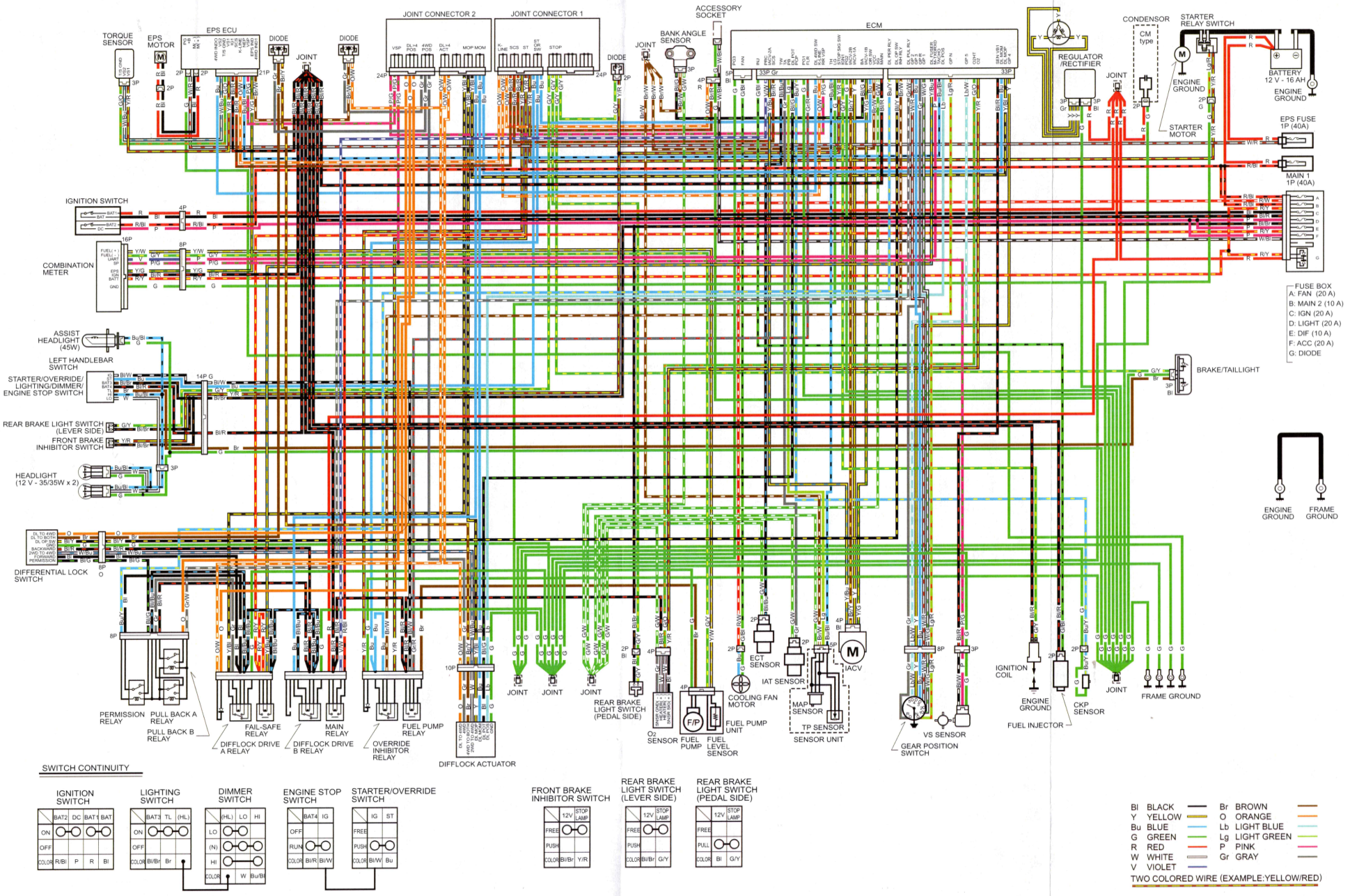
FE1 model ('14)


JOINT CONNECTOR 2
JOINT CONNECTOR 1
ACCESSORY SOCKET
PCM/ECM
BANK ANGLE SENSOR
DIODE
JOINT
REGULATOR /RECTIFIER
CONDENSOR
CM type
STARTER RELAY SWITCH
ENGINE GROUND
BATTERY 12 V - 16 AH
STARTER MOTOR
MAIN 1 1P (40A)
IGNITION SWITCH
COMBINATION METER
ASSIST HEADLIGHT (45W)
LEFT HANDLEBAR SWITCH
STARTER/OVERRIDE/ LIGHTING/DIMMER/ ENGINE STOP SWITCH
GEARSHIFT SWITCH
REAR BRAKE LIGHT SWITCH (LEVER SIDE)
FRONT BRAKE INHIBITOR SWITCH
HEADLIGHT (12 V - 35/35W x 2)
DIFFERENTIAL LOCK SWITCH
FUSE BOX
A: ES (30 A)
B: MAIN 2 (10 A)
C: IGN (20 A)
D: LIGHT (20 A)
E: DIF (10 A)
F: ACC (20 A)
G: DIODE
BRAKE/TAILLIGHT
ENGINE GROUND
FRAME GROUND
PERMISSION RELAY
PULL BACK A RELAY
PULL BACK B RELAY
FAIL-SAFE RELAY
DIFFLOCK DRIVE A RELAY
MAIN RELAY
DIFFLOCK DRIVE B RELAY
FUEL PUMP RELAY
OVERRIDE INHIBITOR RELAY
DIFFLOCK ACTUATOR
REAR BRAKE LIGHT SWITCH (PEDAL SIDE)
O2 SENSOR
FUEL PUMP
FUEL LEVEL SENSOR
FUEL PUMP UNIT
COOLING FAN MOTOR
ECT SENSOR
IAT SENSOR
MAP SENSOR
TP SENSOR
SENSOR UNIT
IACV
SHIFT CONTROL MOTOR
GEAR POSITION SWITCH
VS SENSOR
SHIFT SPINDLE ANGLE SENSOR
IGNITION COIL
ENGINE GROUND
FUEL INJECTOR
CKP SENSOR
JOINT
FRAME GROUND
SWITCH CONTINUITY
IGNITION SWITCH
LIGHTING SWITCH
DIMMER SWITCH
ENGINE STOP SWITCH
STARTER/OVERRIDE SWITCH
GEARSHIFT SWITCH
FRONT BRAKE INHIBITOR SWITCH
REAR BRAKE LIGHT SWITCH (LEVER SIDE)
REAR BRAKE LIGHT SWITCH (PEDAL SIDE)
Bl BLACK
Y YELLOW
Bu BLUE
G GREEN
R RED
W WHITE
V VIOLET
Br BROWN
O ORANGE
Lb LIGHT BLUE
Lg LIGHT GREEN
P PINK
Gr GRAY
TWO COLORED WIRE (EXAMPLE:YELLOW/RED)

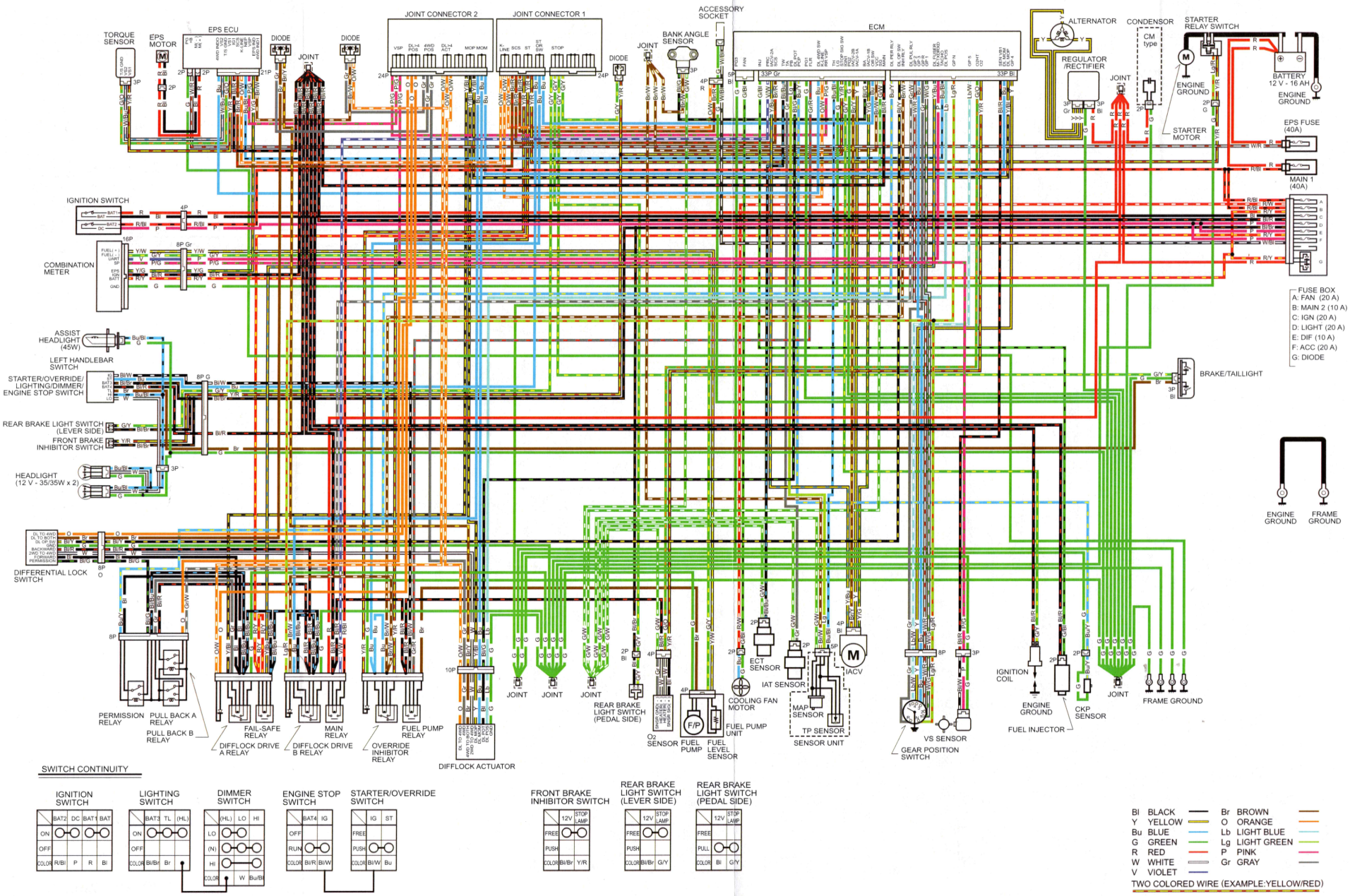
FE1 model (After '14)



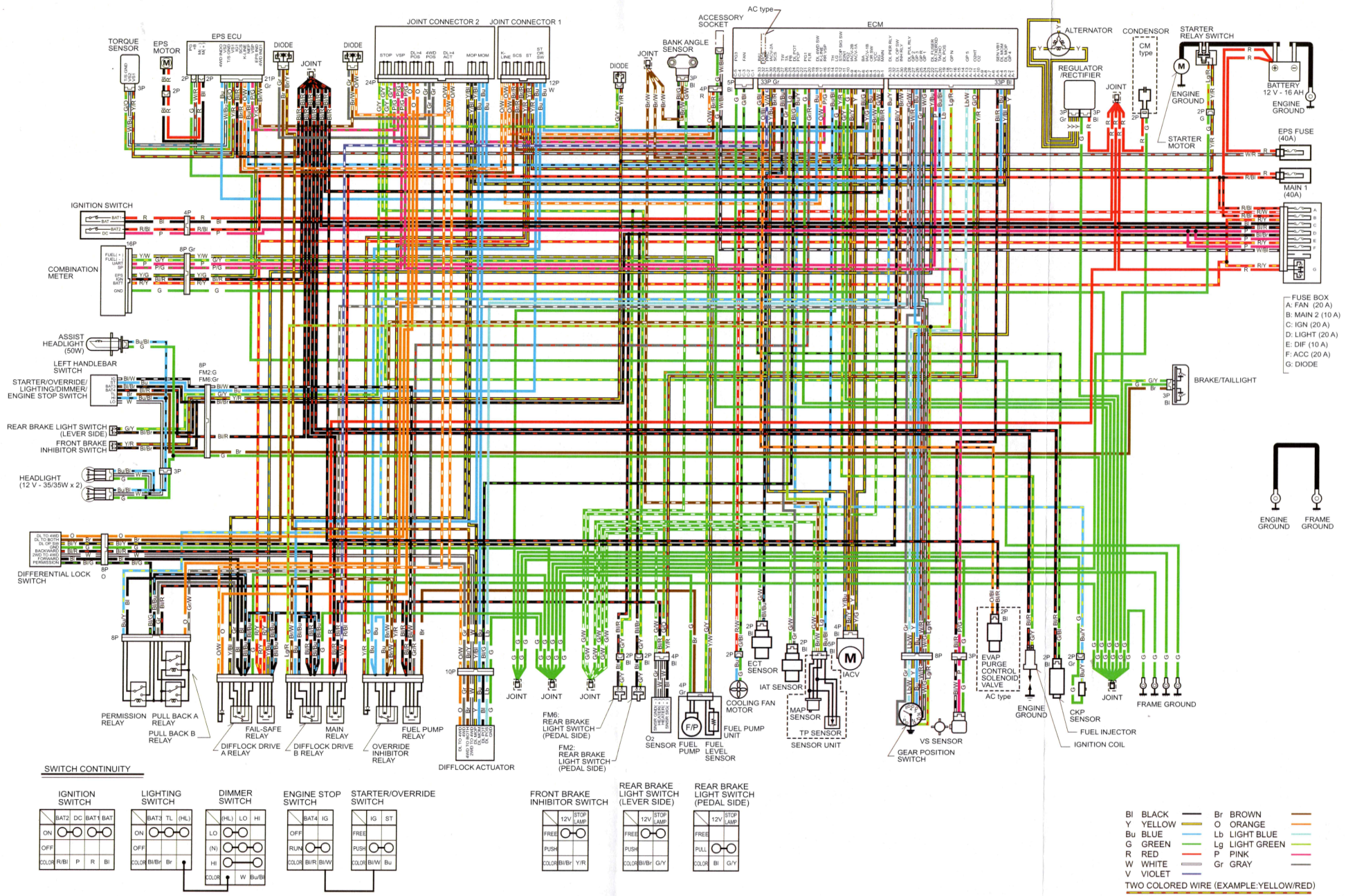
FM2 model ('14)


TORQUE SENSOR
EPS MOTOR
EPS ECU
DIODE
JOINT
JOINT CONNECTOR 2
JOINT CONNECTOR 1
ACCESSORY SOCKET
BANK ANGLE SENSOR
ECM
REGULATOR /RECTIFIER
CONDENSOR
CM type
STARTER RELAY SWITCH
ENGINE GROUND
BATTERY 12 V - 16 AH
STARTER MOTOR
EPS FUSE 1P (40A)
MAIN 1 1P (40A)
IGNITION SWITCH
COMBINATION METER
ASSIST HEADLIGHT (45W)
LEFT HANDLEBAR SWITCH
STARTER/OVERRIDE/ LIGHTING/DIMMER/ ENGINE STOP SWITCH
REAR BRAKE LIGHT SWITCH (LEVER SIDE)
FRONT BRAKE INHIBITOR SWITCH
HEADLIGHT (12 V - 35/35W x 2)
BRAKE/TAILLIGHT
FUSE BOX
A: FAN (20 A)
B: MAIN 2 (10 A)
C: IGN (20 A)
D: LIGHT (20 A)
E: DIF (10 A)
F: ACC (20 A)
G: DIODE
ENGINE GROUND
FRAME GROUND
DIFFERENTIAL LOCK SWITCH
PERMISSION RELAY
PULL BACK A RELAY
PULL BACK B RELAY
FAIL-SAFE RELAY
DIFFLOCK DRIVE A RELAY
MAIN RELAY
DIFFLOCK DRIVE B RELAY
FUEL PUMP RELAY
OVERRIDE INHIBITOR RELAY
DIFFLOCK ACTUATOR
REAR BRAKE LIGHT SWITCH (PEDAL SIDE)
O2 SENSOR
FUEL PUMP
FUEL LEVEL SENSOR
FUEL PUMP UNIT
COOLING FAN MOTOR
ECT SENSOR
IAT SENSOR
MAP SENSOR
TP SENSOR
SENSOR UNIT
IACV
VS SENSOR
GEAR POSITION SWITCH
IGNITION COIL
ENGINE GROUND
CKP SENSOR
FUEL INJECTOR
FRAME GROUND
SWITCH CONTINUITY
IGNITION SWITCH
LIGHTING SWITCH
DIMMER SWITCH
ENGINE STOP SWITCH
STARTER/OVERRIDE SWITCH
FRONT BRAKE INHIBITOR SWITCH
REAR BRAKE LIGHT SWITCH (LEVER SIDE)
REAR BRAKE LIGHT SWITCH (PEDAL SIDE)
Bl BLACK
Y YELLOW
Bu BLUE
G GREEN
R RED
W WHITE
V VIOLET
Br BROWN
O ORANGE
Lb LIGHT BLUE
Lg LIGHT GREEN
P PINK
Gr GRAY
TWO COLORED WIRE (EXAMPLE:YELLOW/RED)

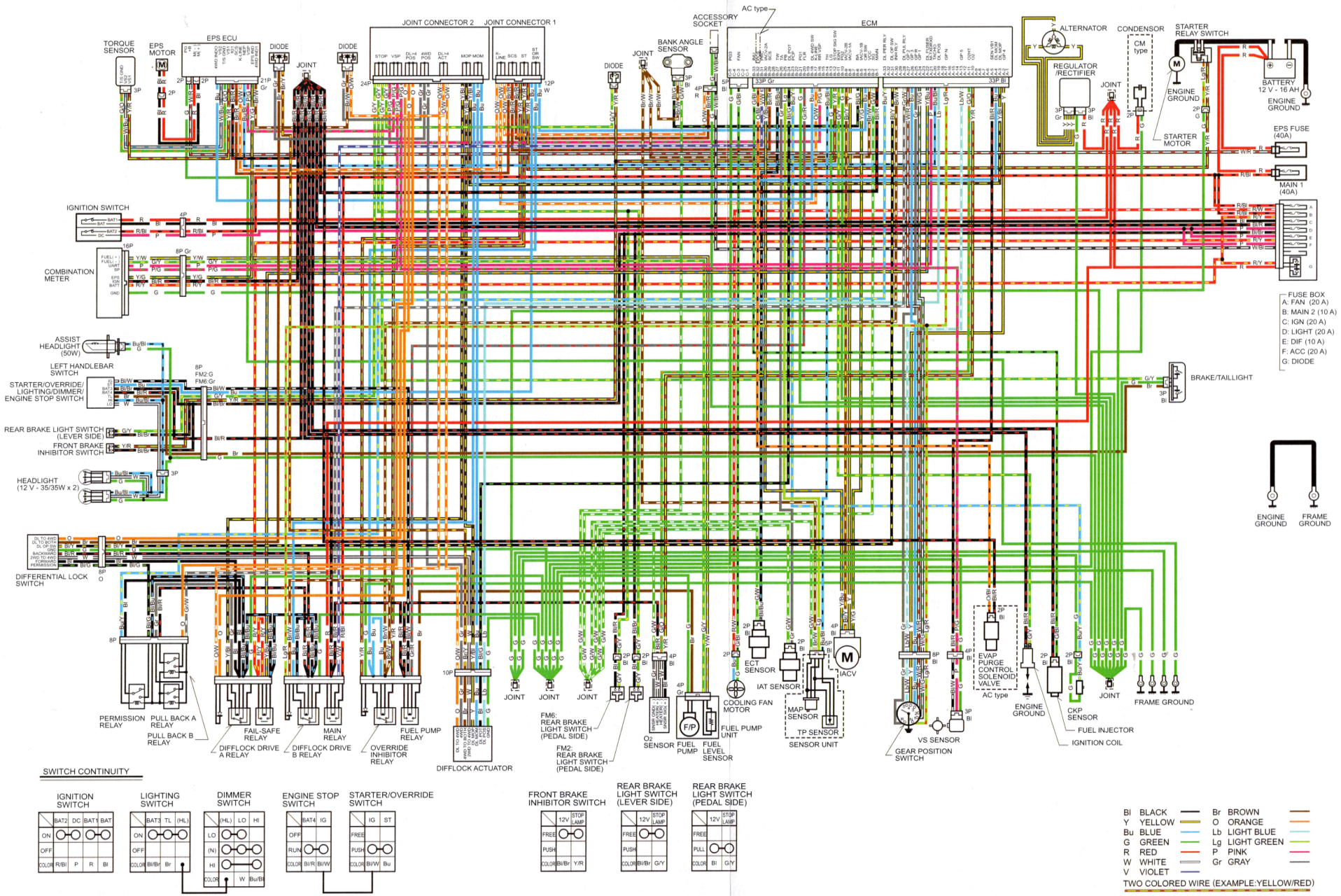
FM2 model ('15 – '19)



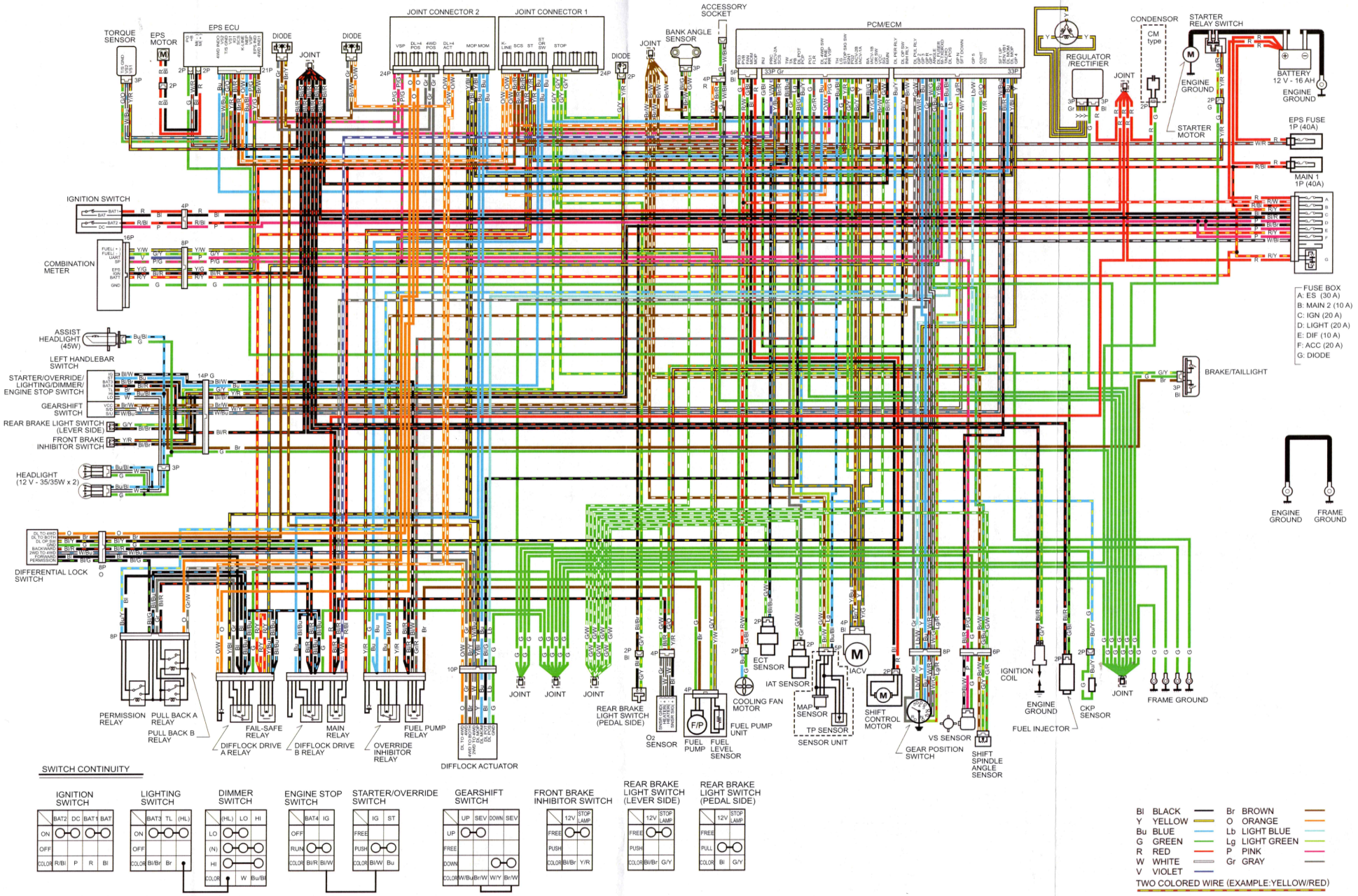
FM2 model ('20 – '21)/FM6 model ('20 – '21)



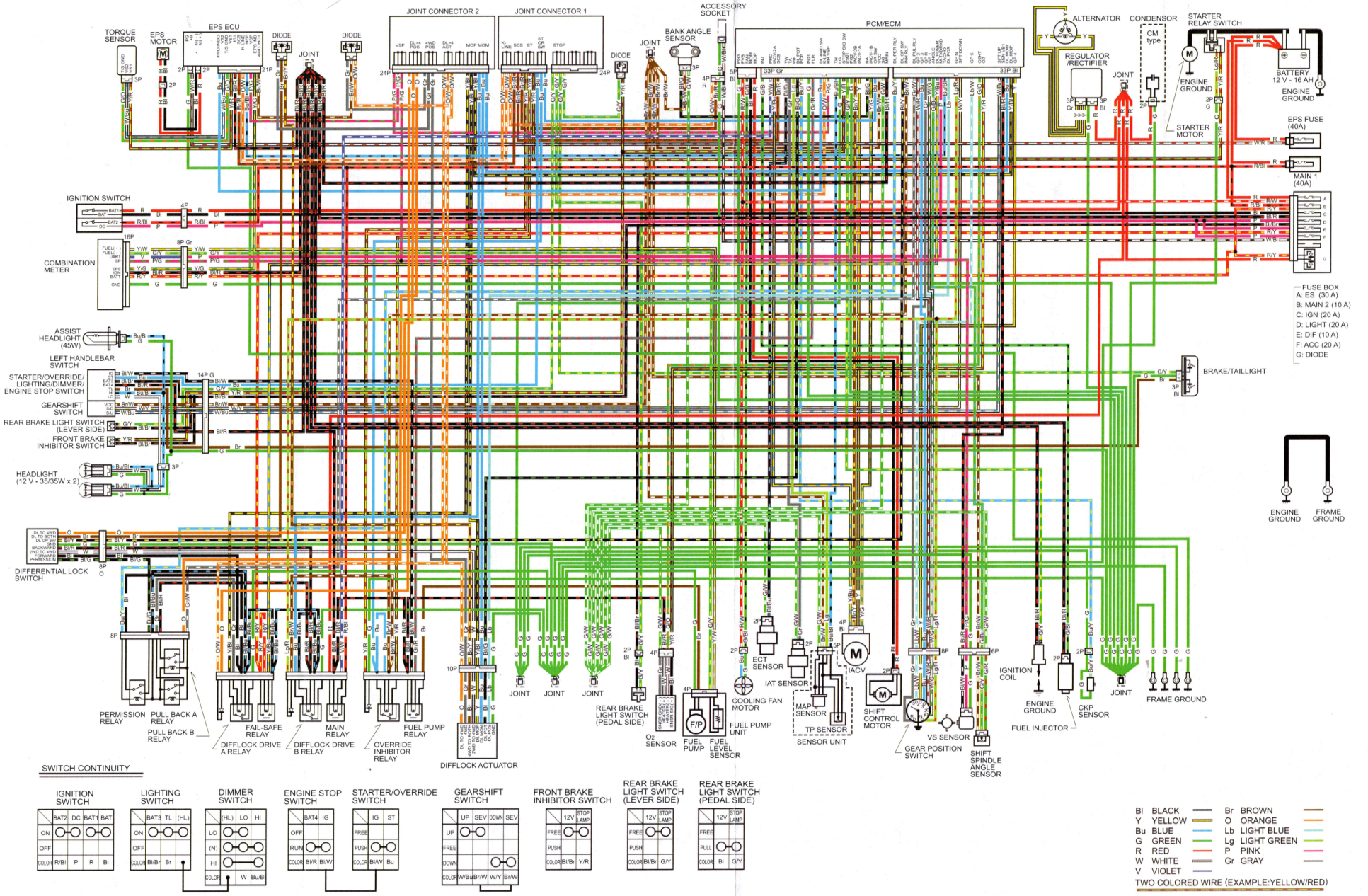
FM2 model (After '21)/FM6 model (After '21)



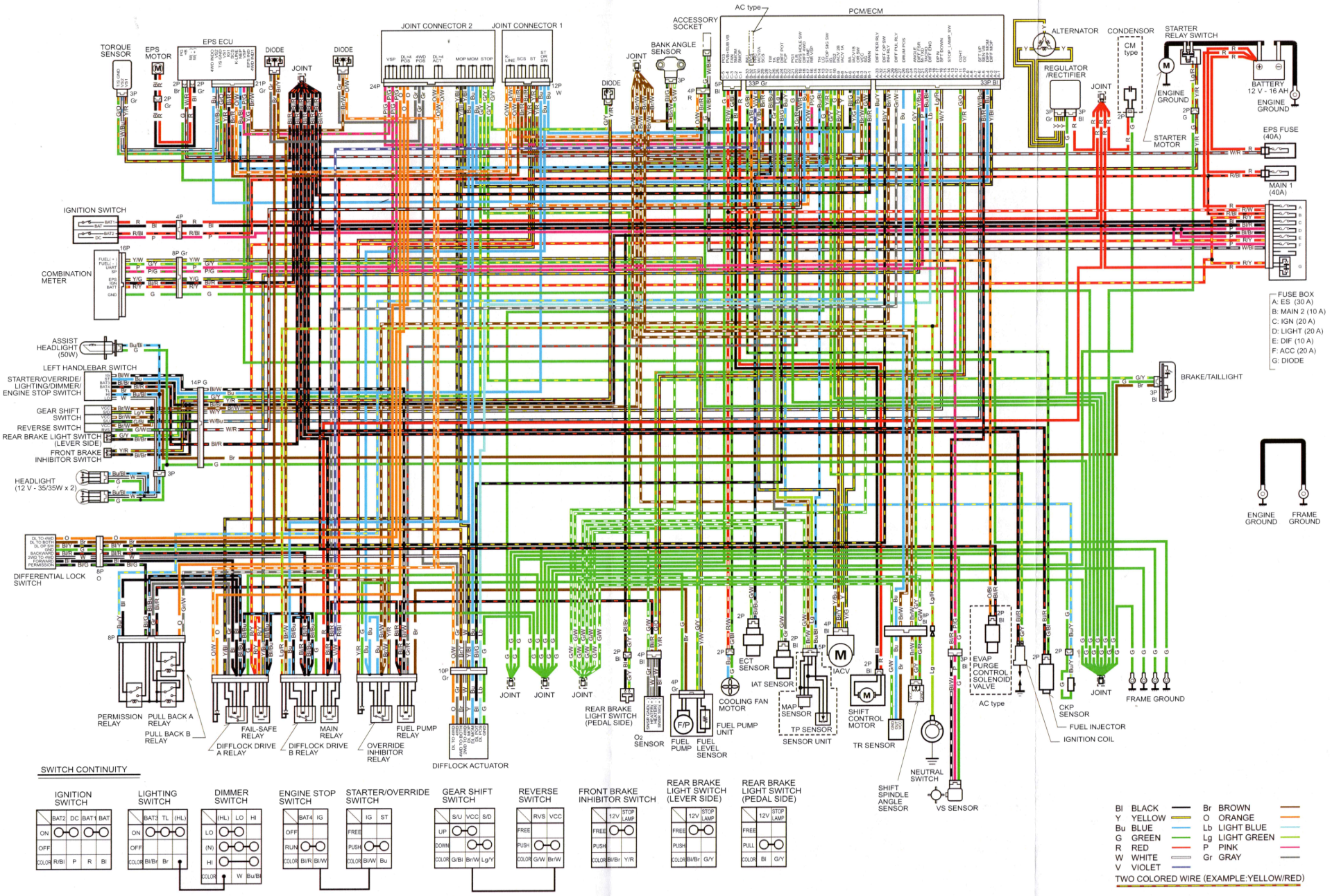
FE2 model ('14)


TORQUE SENSOR
EPS MOTOR
EPS ECU
DIODE
JOINT
JOINT CONNECTOR 2
JOINT CONNECTOR 1
ACCESSORY SOCKET
BANK ANGLE SENSOR
PCM/ECM
REGULATOR /RECTIFIER
CONDENSOR
CM type
STARTER RELAY SWITCH
BATTERY 12 V - 16 AH
ENGINE GROUND
STARTER MOTOR
EPS FUSE 1P (40A)
MAIN 1P (40A)
IGNITION SWITCH
COMBINATION METER
ASSIST HEADLIGHT (45W)
LEFT HANDLEBAR SWITCH
STARTER/OVERRIDE/ LIGHTING/DIMMER/ ENGINE STOP SWITCH
GEARSHIFT SWITCH
REAR BRAKE LIGHT SWITCH (LEVER SIDE)
FRONT BRAKE INHIBITOR SWITCH
HEADLIGHT (12 V - 35/35W x 2)
DIFFERENTIAL LOCK SWITCH
BRAKE/TAILLIGHT
FUSE BOX
A: ES (30 A)
B: MAIN 2 (10 A)
C: IGN (20 A)
D: LIGHT (20 A)
E: DIF (10 A)
F: ACC (20 A)
G: DIODE
ENGINE GROUND
FRAME GROUND
PERMISSION RELAY
PULL BACK A RELAY
PULL BACK B RELAY
FAIL-SAFE RELAY
DIFFLOCK DRIVE A RELAY
DIFFLOCK DRIVE B RELAY
MAIN RELAY
OVERRIDE INHIBITOR RELAY
FUEL PUMP RELAY
DIFFLOCK ACTUATOR
JOINT
REAR BRAKE LIGHT SWITCH (PEDAL SIDE)
O2 SENSOR
FUEL PUMP
FUEL LEVEL SENSOR
FUEL PUMP UNIT
COOLING FAN MOTOR
ECT SENSOR
IAT SENSOR
MAP SENSOR
TP SENSOR
SENSOR UNIT
IACV
SHIFT CONTROL MOTOR
GEAR POSITION SWITCH
VS SENSOR
SHIFT SPINDLE ANGLE SENSOR
IGNITION COIL
FUEL INJECTOR
CKP SENSOR
SWITCH CONTINUITY
IGNITION SWITCH
LIGHTING SWITCH
DIMMER SWITCH
ENGINE STOP SWITCH
STARTER/OVERRIDE SWITCH
GEARSHIFT SWITCH
FRONT BRAKE INHIBITOR SWITCH
REAR BRAKE LIGHT SWITCH (LEVER SIDE)
REAR BRAKE LIGHT SWITCH (PEDAL SIDE)
Bl BLACK
Y YELLOW
Bu BLUE
G GREEN
R RED
W WHITE
V VIOLET
Br BROWN
O ORANGE
Lb LIGHT BLUE
Lg LIGHT GREEN
P PINK
Gr GRAY
TWO COLORED WIRE (EXAMPLE:YELLOW/RED)

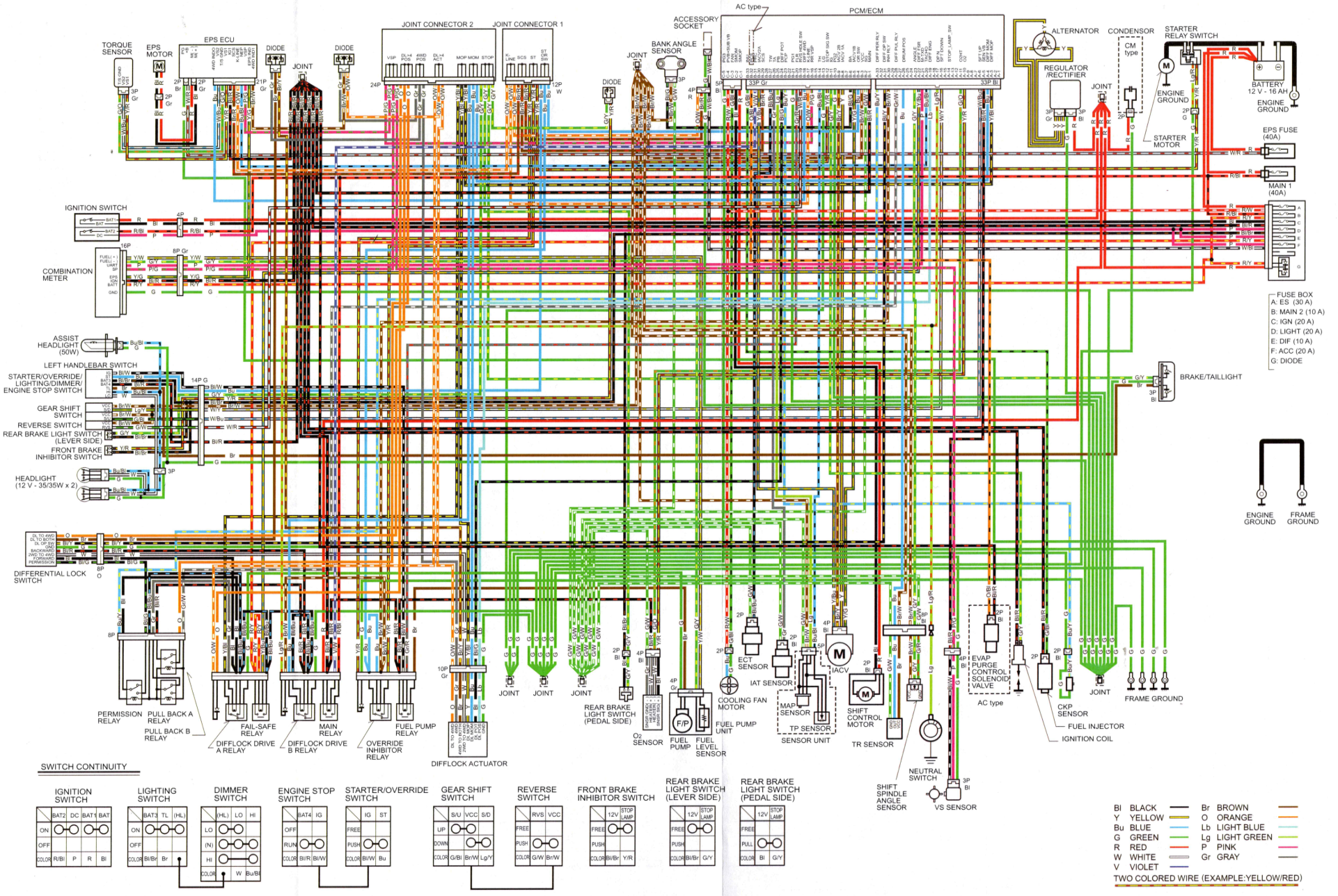
FE2 model ('15 – '19)



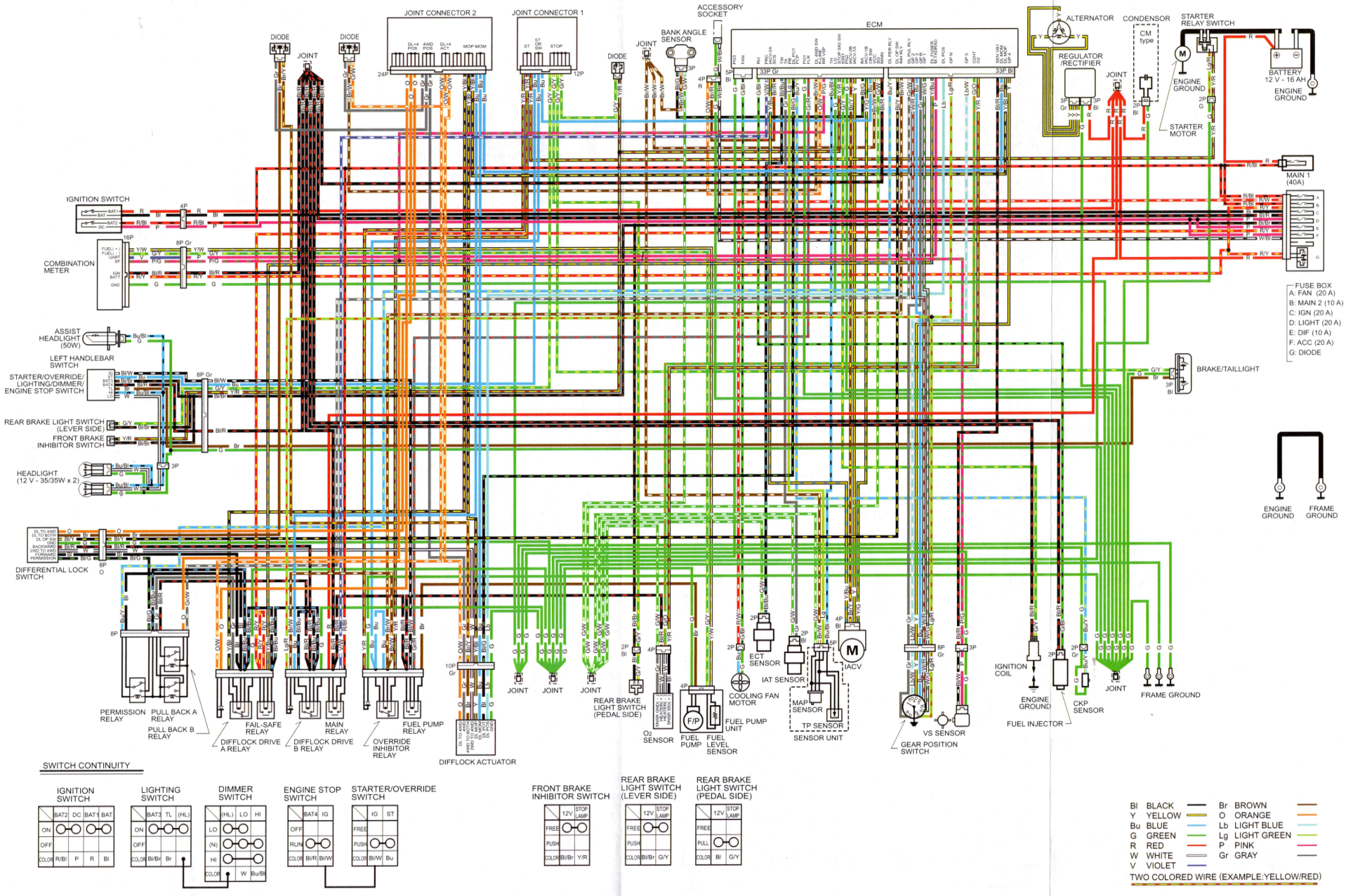
FE2 model (’20 – ’21)



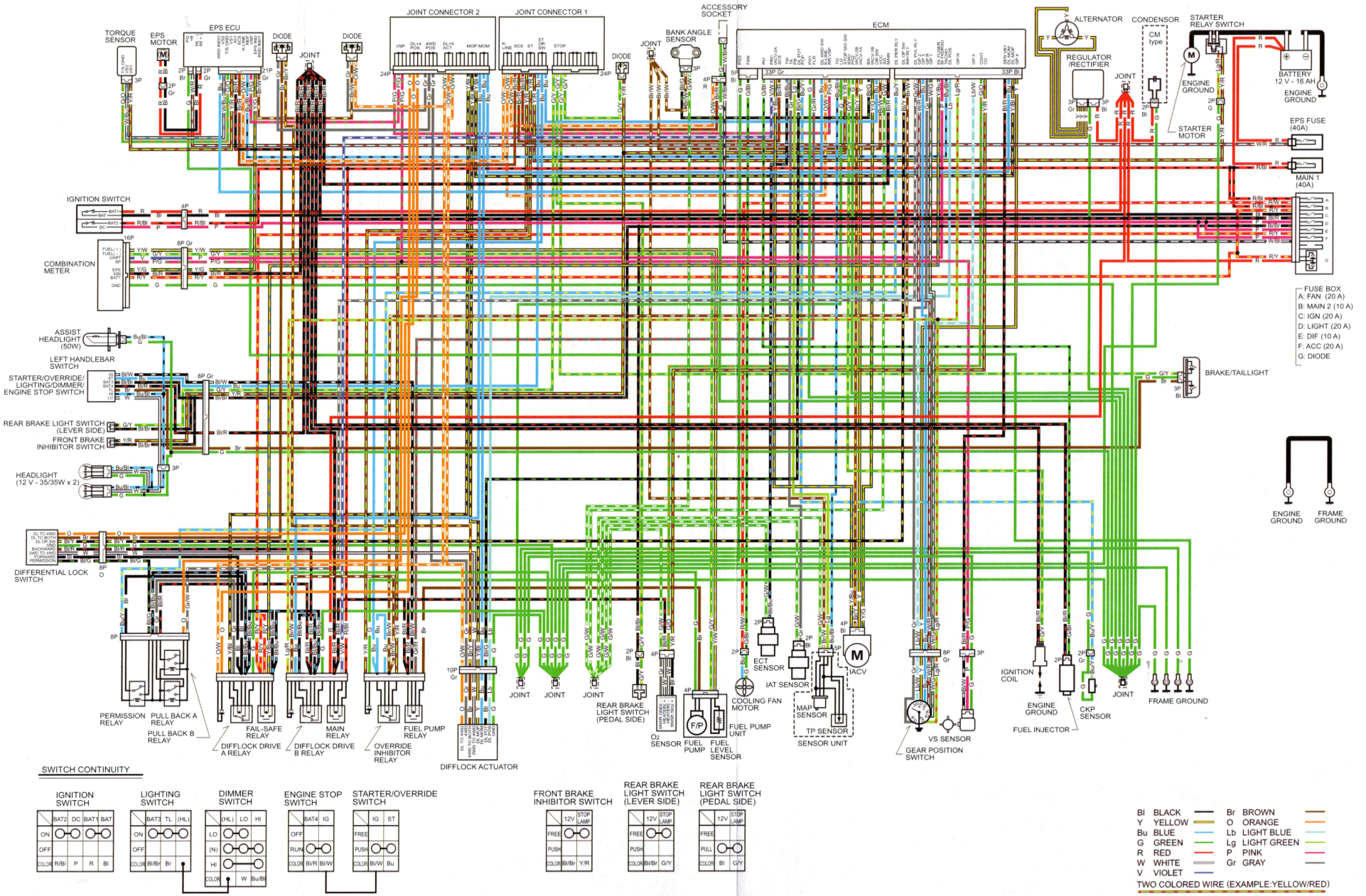
FE2 model (After '21)



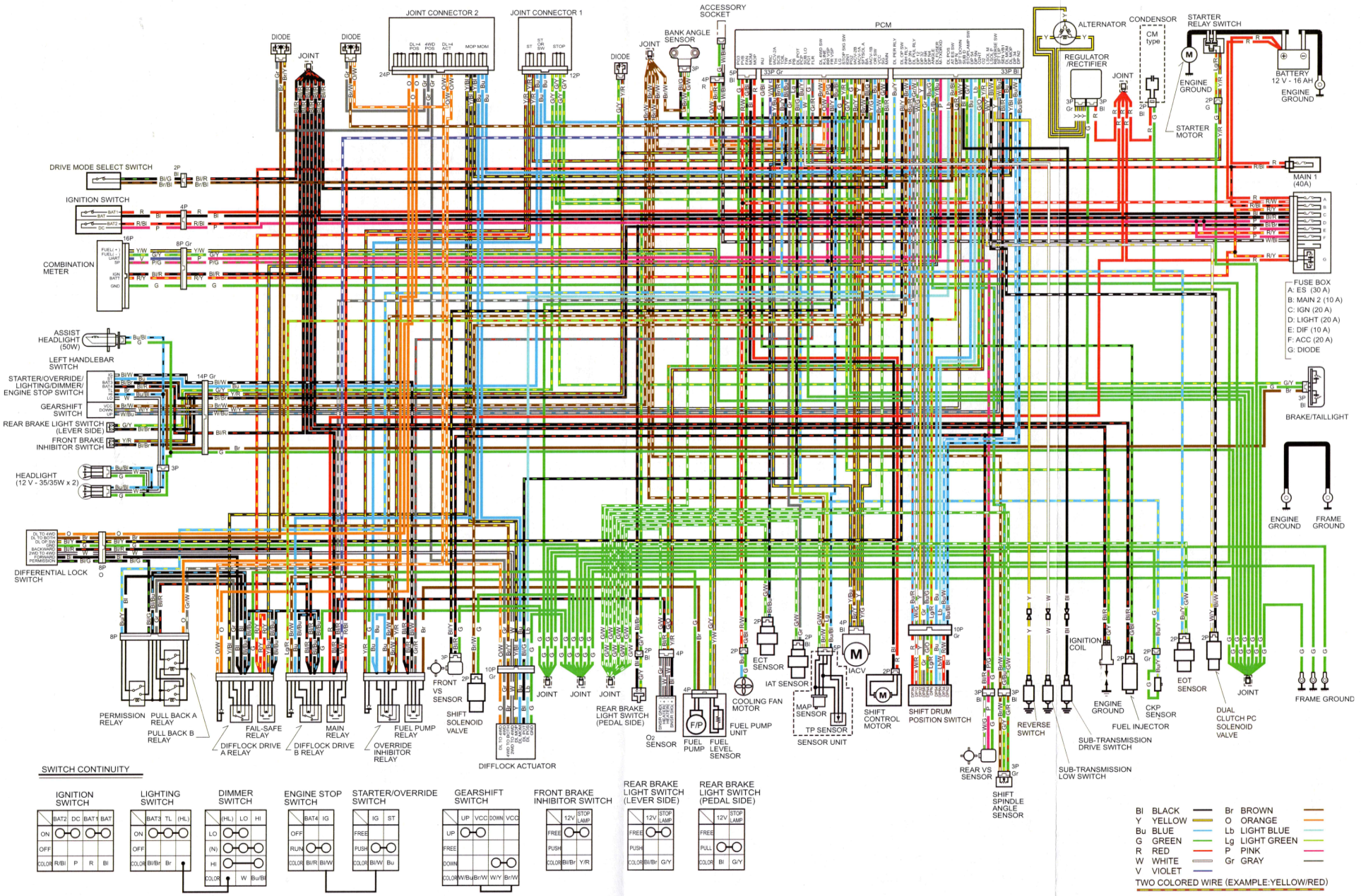
FM5 model (After '14)



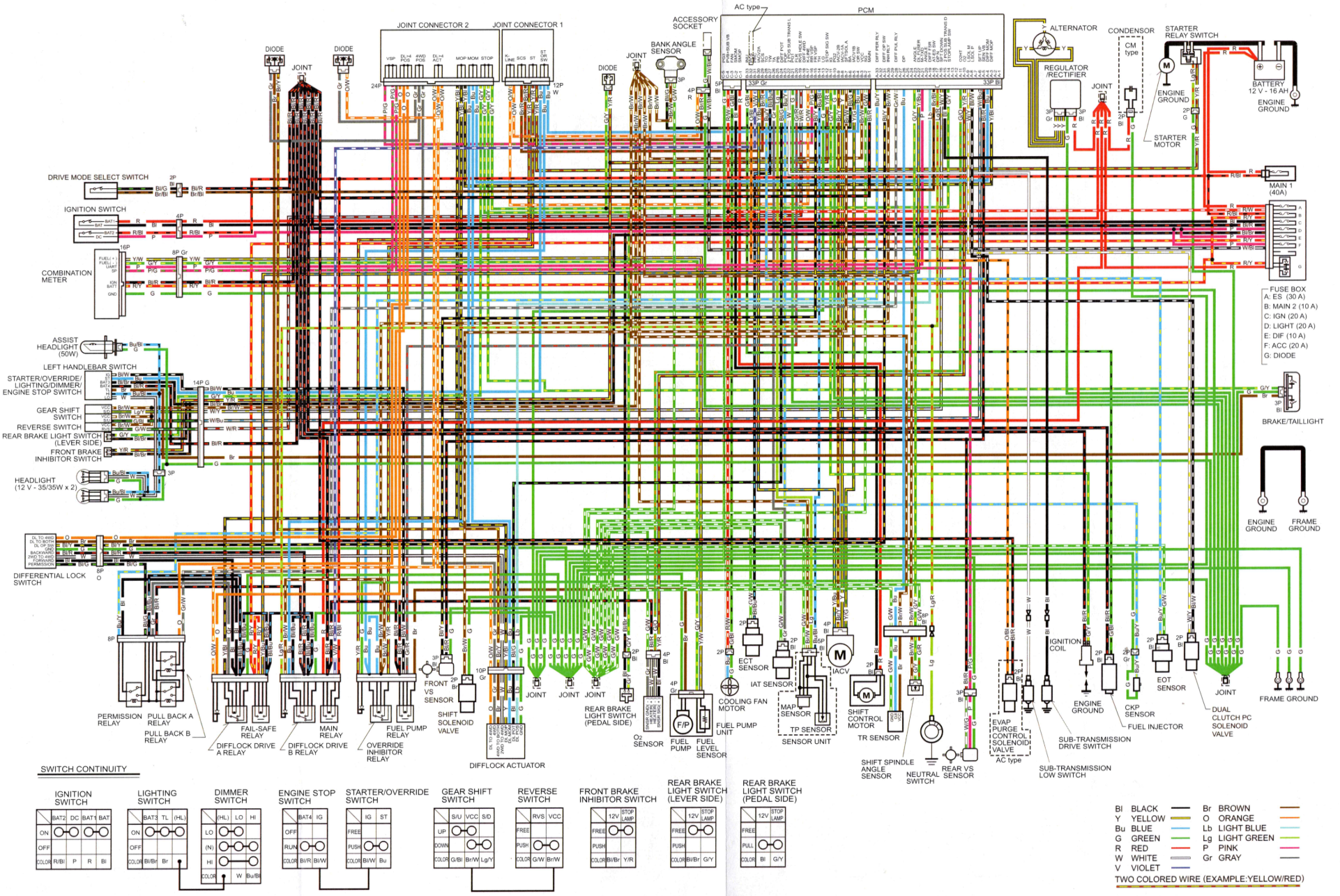
FM6 model ('15 – '19)/FM7 model (After '14)



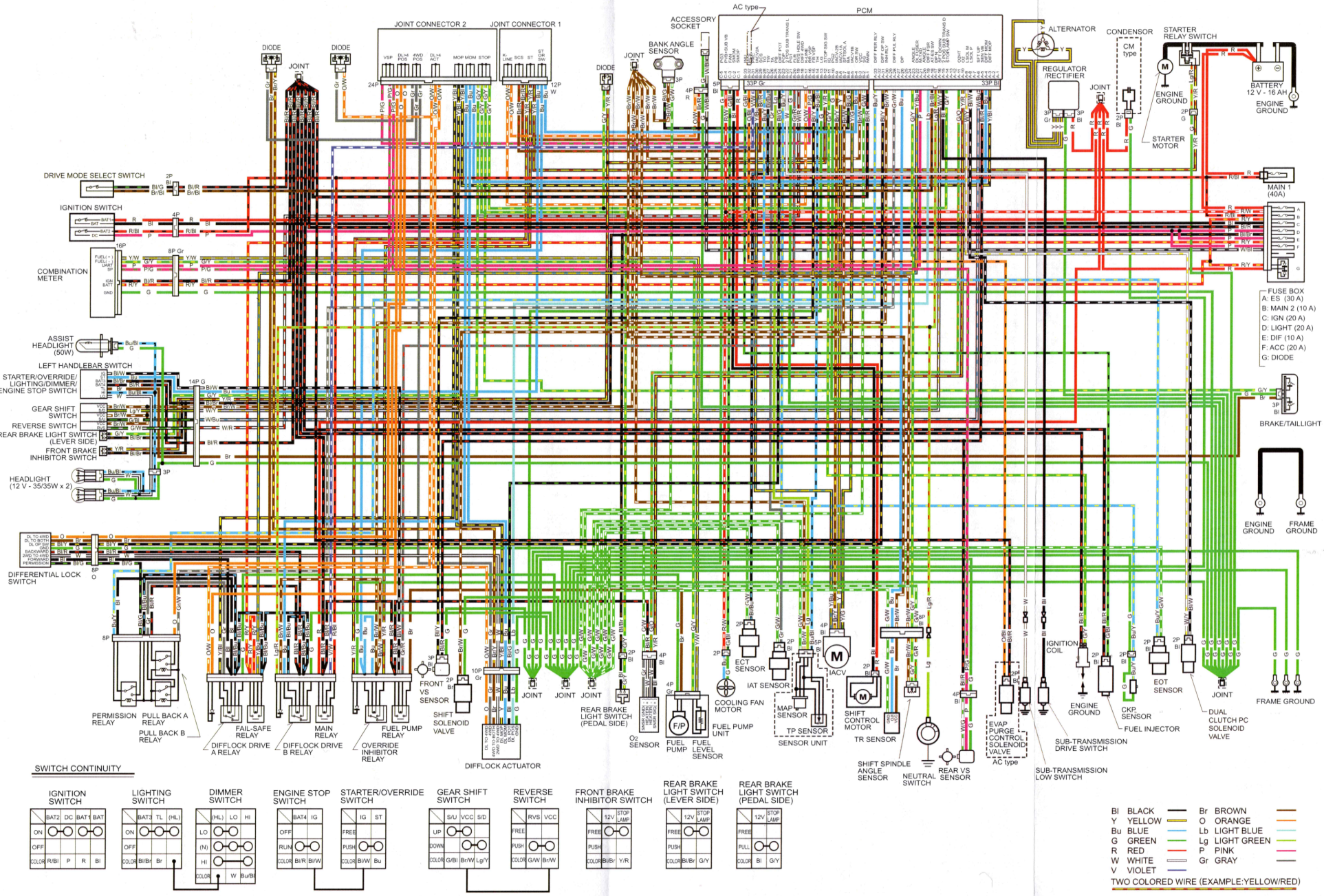
FA5 model ('15 – '19)



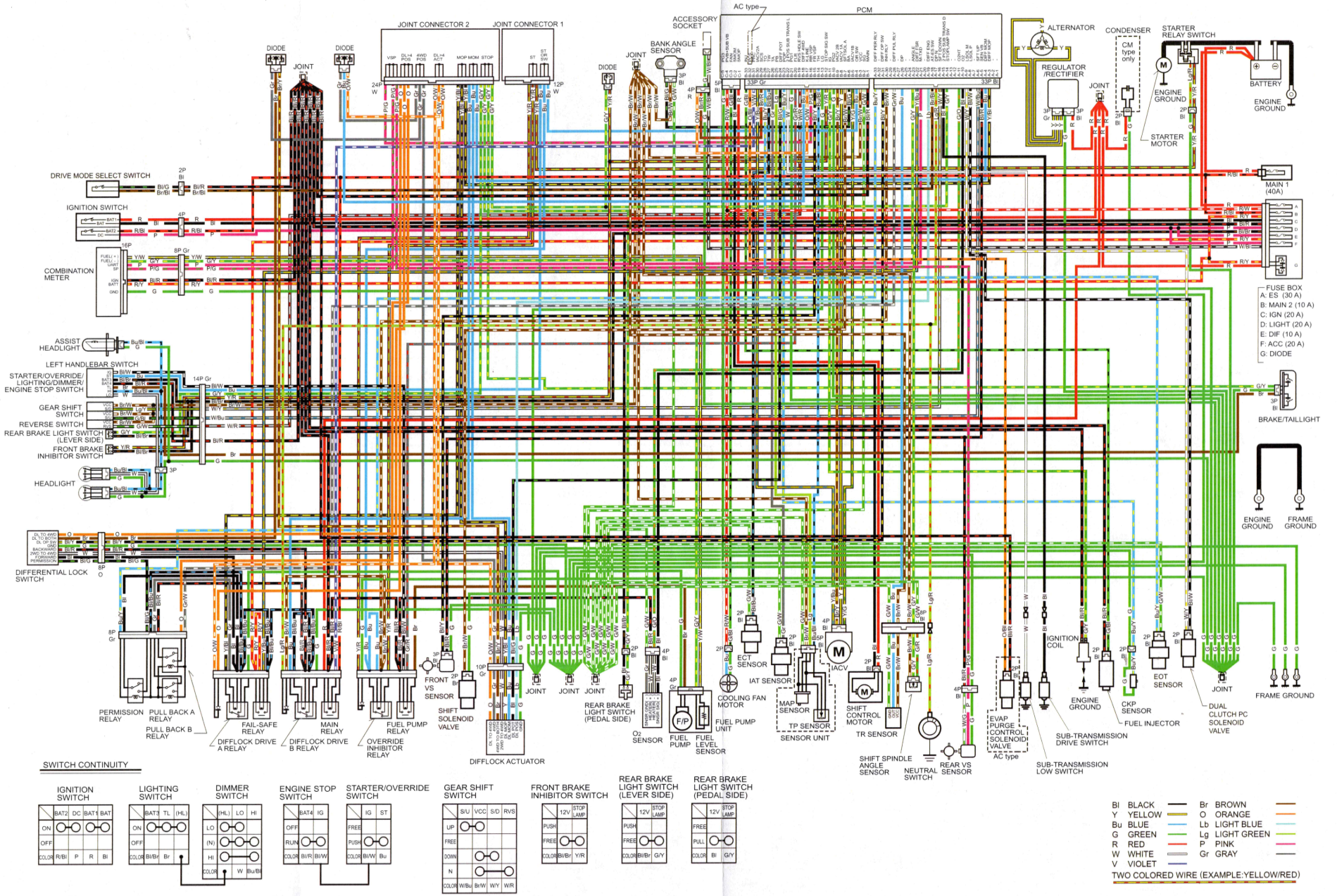
FA5 model ('20 – '21)



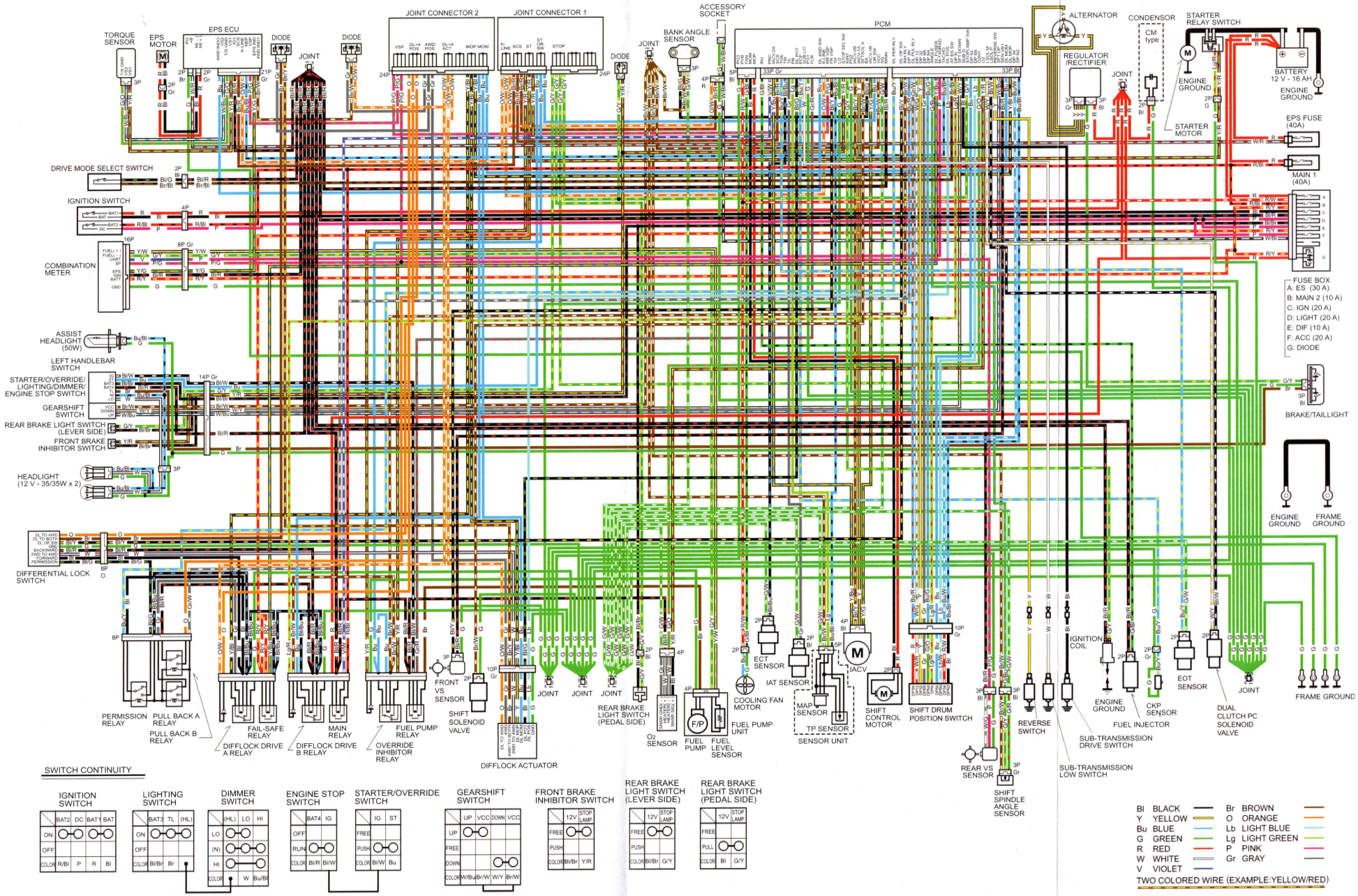
FA5 model ('22 –'23)



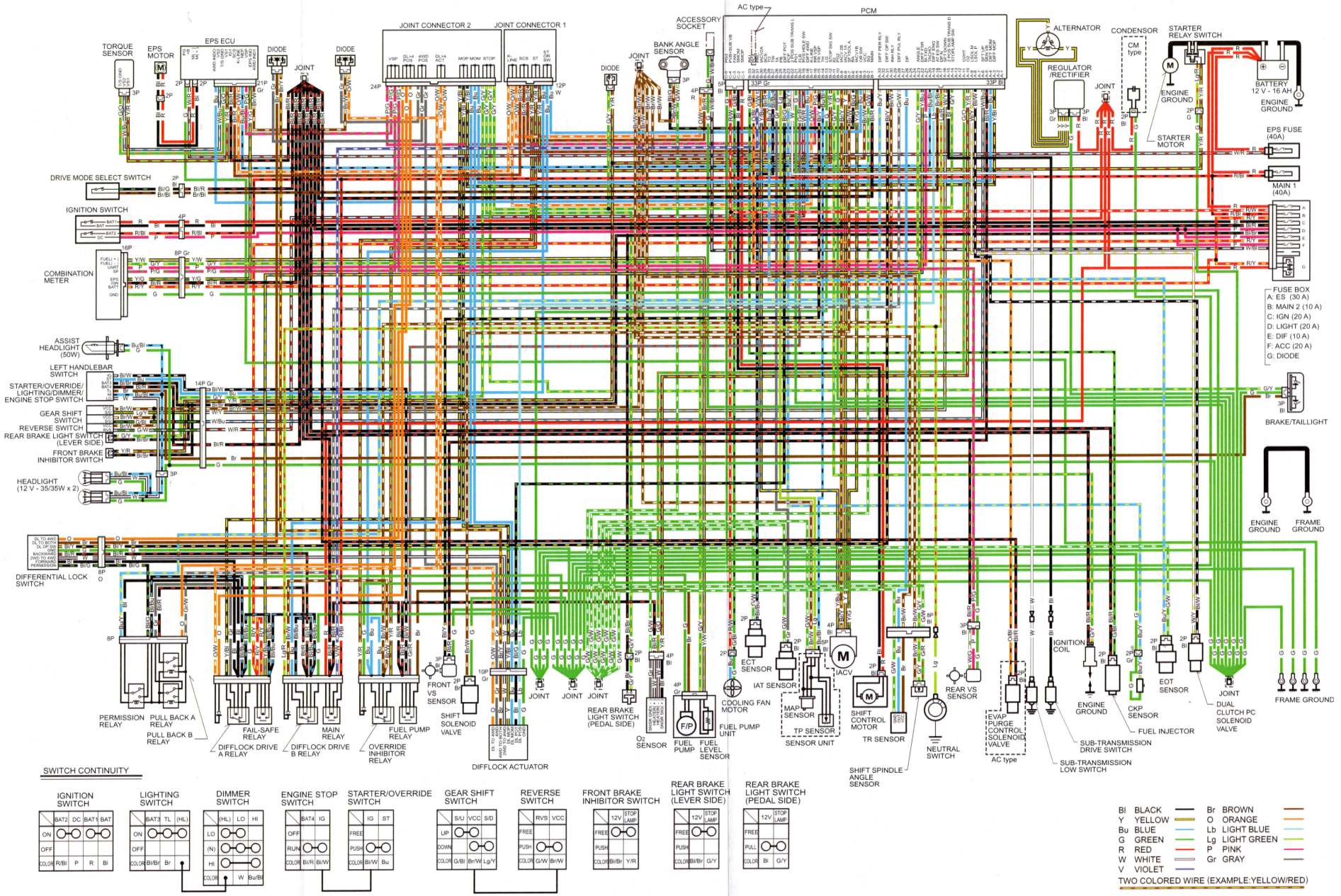
FA5 model (After '23)



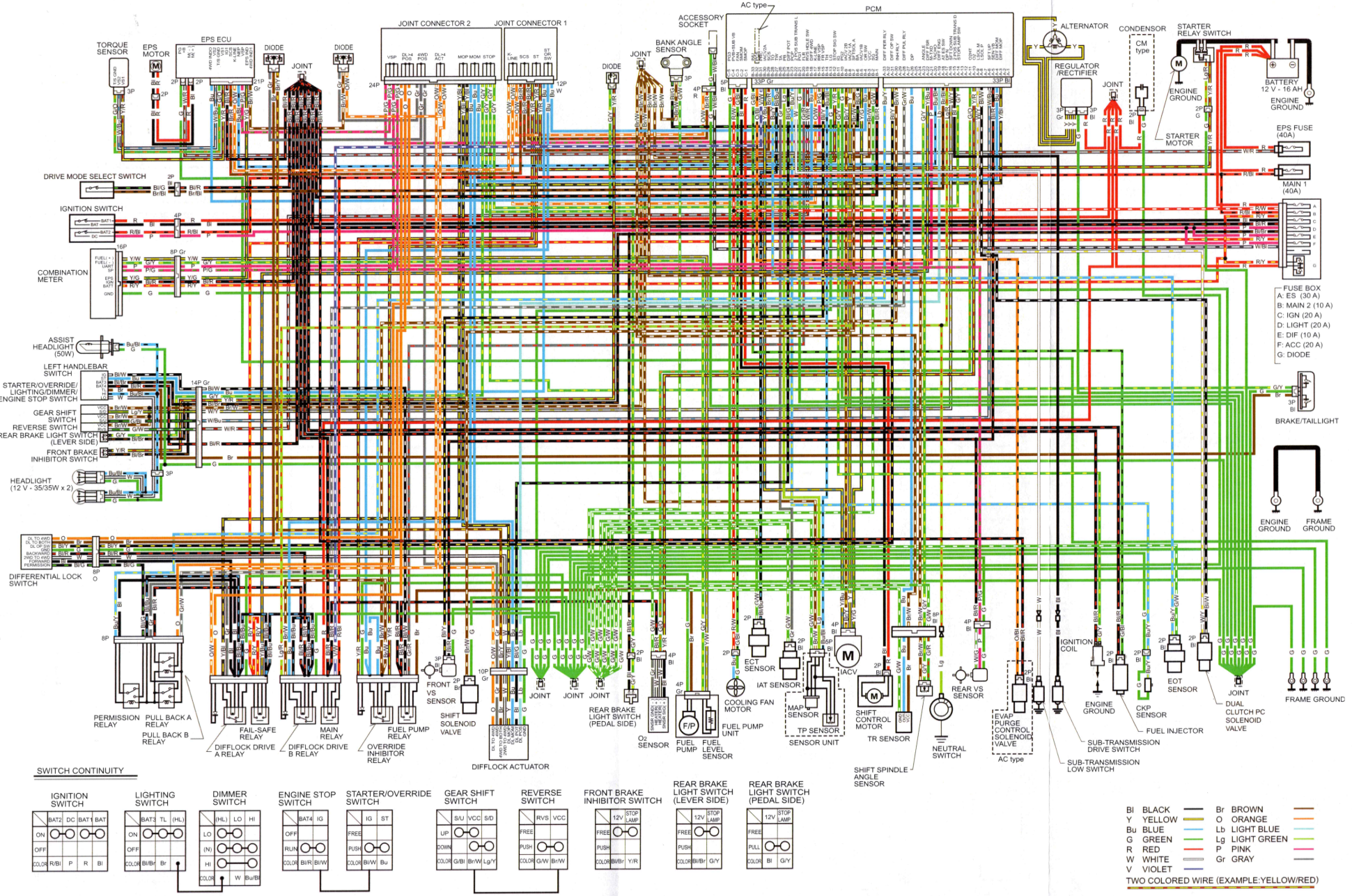
FA6 model ('15 – '19)/FA7 model ('15 – '19)



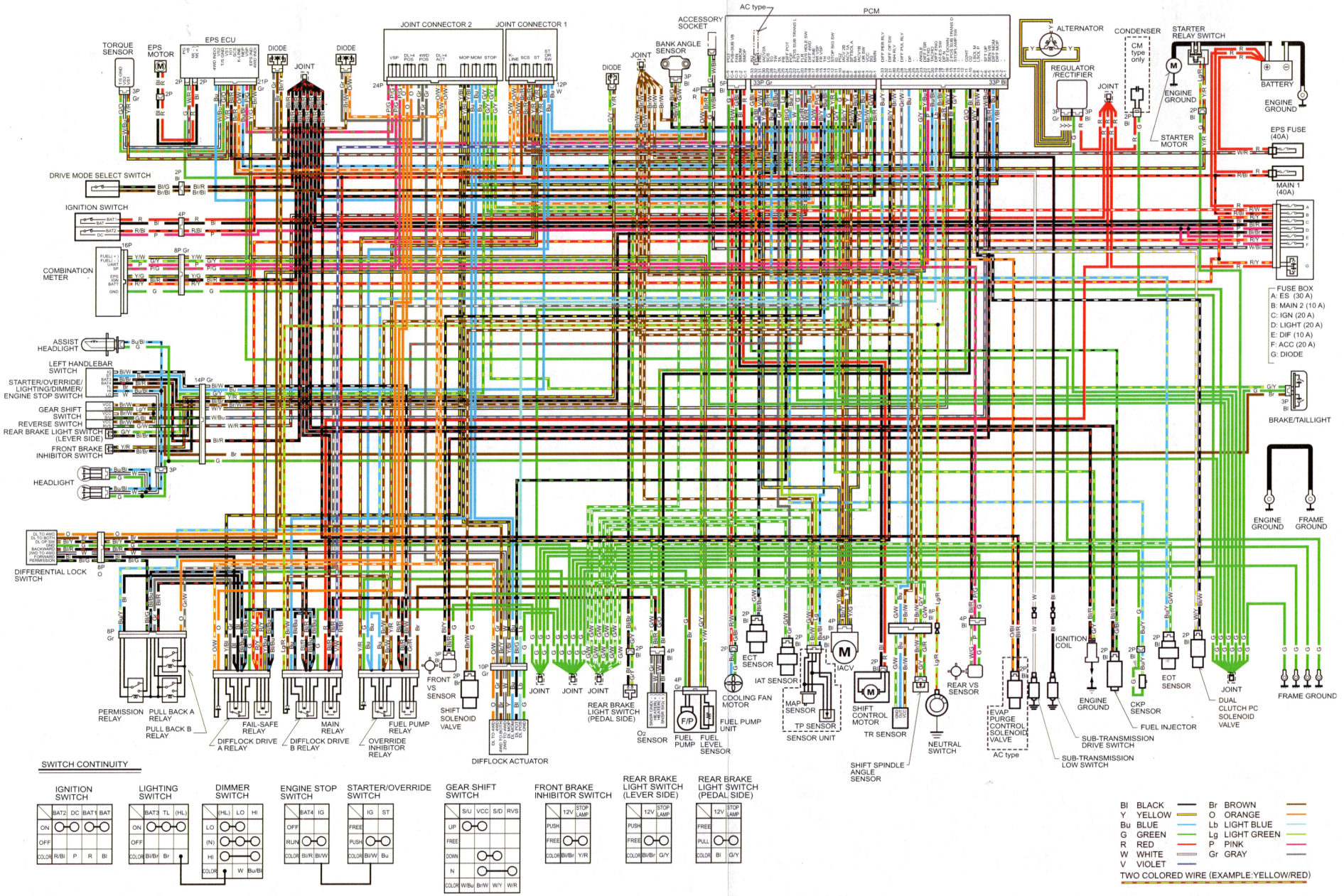
FA6 model ('20 – '21)/FA7 model ('20 – '21)



FA6 model ('22 –'23)/FA7 model ('22 –'23)



FA6 model (After '23)/FA7 model (After '23)



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